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COMMUNICATIONS SETUP
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BY JOHNSON CONTROLS

COMMUNICATIONS SETUP

FRICK® QUANTUM™ LX CONDENSER/VESSEL CONTROL PANEL

Version 3.0x

Table of Contents

The Quantum™ has the capability of being modified by the user/owner in order to obtain different performance characteristics. Any modification to the standard default settings may have a severe negative impact on the operation and performance of the equipment. Any modification to these control settings is the sole responsibility of the user/owner and Frick® disclaims any liability for the consequences of these modifications. It is possible that the modification of these settings may cause improper operation and performance that results in property damage, personal injury or death. It is the responsibility of the user/owner to evaluate and assess the consequences of their actions prior to modifying the controls for this unit.

INTRODUCTION TO THE QUANTUM™ LX

QUANTUM™ DESCRIPTION

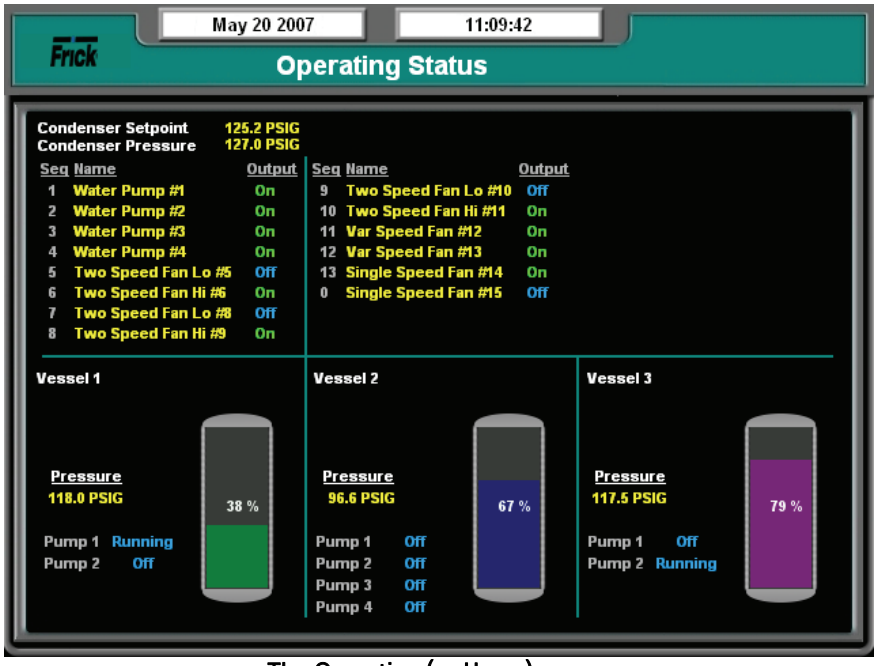
The Quantum™ LX control panel utilizes the Quantum™ 4 microprocessor board as the brains of the system. The LX portion of the Quantum™ name actually refers to the operating system (software), and the operator interface (physical display and keypad). When you see the name Quantum™ 4, the physical hardware of the controller is being referred to (microprocessor), whereas Quantum™ LX refers to the software, and how the operator interacts with the software (through the display/keypad).

As an example, the Quantum™ 4 controller contains the physical Serial and Ethernet connections that the user connects to, while the Quantum™ LX software determines how those connections are used.

These connections are known as *PROTOCOLS*, and are both hardware and software based. The hardware portion of the protocol (Quantum™ 4) tells how the wiring connections are physically made, while the software portion (Quantum™ LX) tells how the data to the connection is to be formatted and interpreted.

The Quantum™ LX software is based on a web browser format, and has the capability of communication through both Serial and Ethernet protocols.

The following screen is representative of what the operator will see when the unit is first powered up. This is called the Home screen. Be aware that the content of the screen and the picture shown may differ, based upon the actual configuration and installed options.



The Operating (or Home) screen

HOW TO USE THIS MANUAL

The purpose of this manual is provide the necessary information (protocols, data registers, wiring, etc.) to allow the end user to reliably communicate with the Quantum™ LX via various communications methods (to be described later) for the purpose of obtaining and sending data and/or for Condenser/Vessel control.

The Quantum™ LX does NOT begin any communications conversations on its own, it only responds to queries (requests) from external devices.

For serial communications connections, refer to the section entitled ***Quantum™ Serial Communication*** for the correct wiring and jumper settings of RS-232, RS-422, or RS-485. Also, refer to the drawing of the ***Quantum™ 4 Main Board*** section to identify wiring configurations for Com-2.

For Ethernet communications, refer to the section entitled ***Ethernet and Networking***. Ethernet does not require any jumpers to be installed.

For information on software protocols, refer to the section entitled ***Protocol Description***.

To access specific data within the Quantum™ LX, refer to the ***Data Tables***.

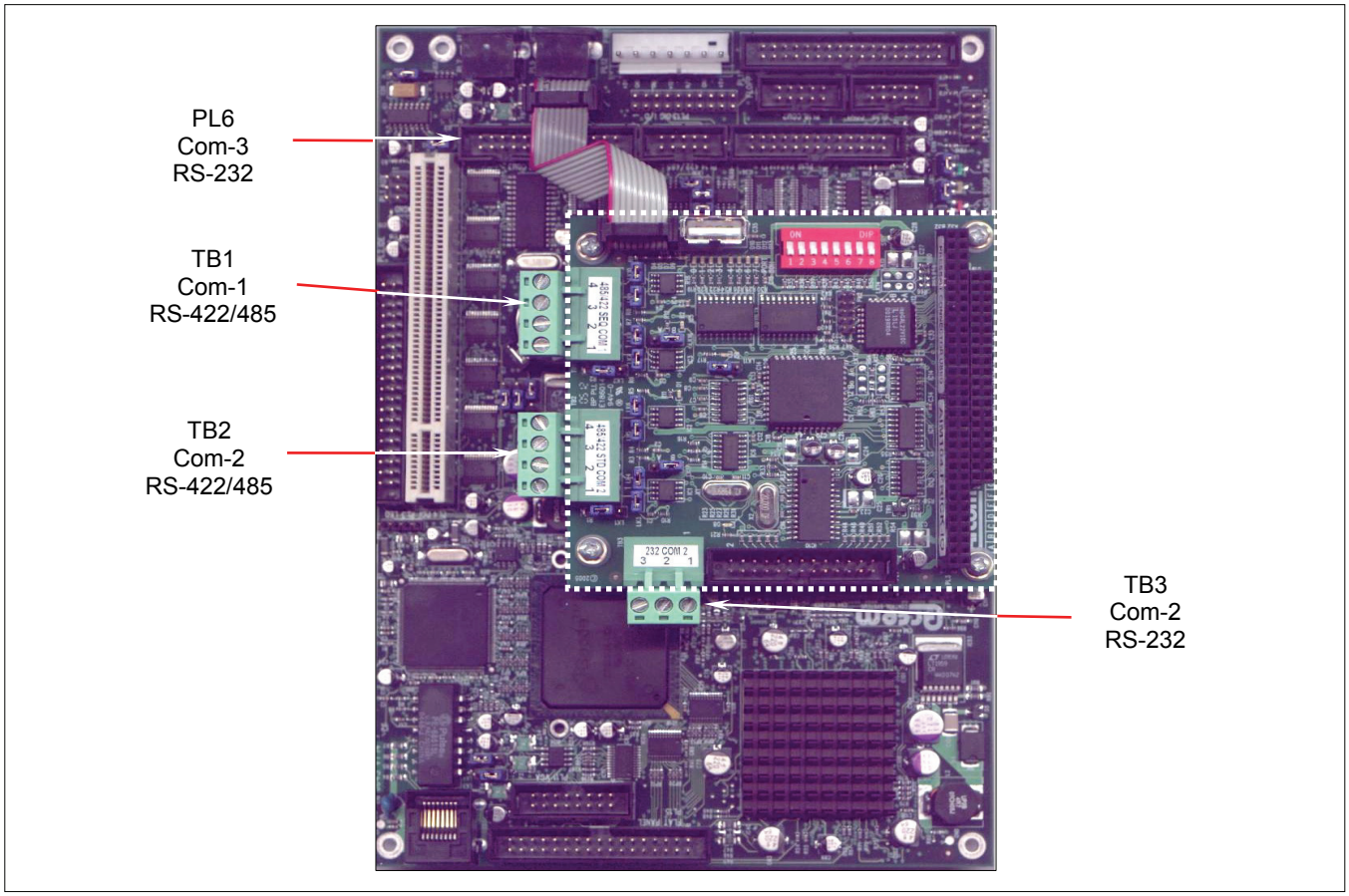
SERIAL COMMUNICATIONS

GENERAL DESCRIPTION

Serial communications to and from the Quantum™ LX can use RS-232, RS-422 and/or RS-485 hardware protocol. These three hardware protocols can be connected via Com-1 and Com-2 for RS-422/485, and Com-2 and Com-3 for RS-232. The reason that Com-2 can be either RS-232 or RS-422/485 will be explained in the section entitled ***Com-1 and Com-2 Description***.

The Com-1 and Com-2 serial communications portion of the Quantum™ controller consists of a daughter board, mounted to the main controller. In addition to external forms of serial communication (to be discussed shortly), the keypad also connects here. Refer to the following pictorial of the Com-1 and Com-2 communications daughter board.

Com-3 is another serial port (RS-232) that may be used in addition to Com-1 and Com-2. The location of Com-3 is on the main processor board, as shown below will be explained in the section entitled ***Com-3 Description***.



Com-1, Com-2 and Com-3 Ports

COM-1 AND COM-2 DESCRIPTION

The board pictured above actually has three serial communications ports (labeled as TB1, TB2 and TB3). TB1 is known as Com-1, and is reserved solely for RS-422/485 communications. It can be used for external communications to the outside world.

TB2 is known as Com-2. However, TB3 is also known as Com-2. The difference here is that TB2 is for RS-422/485 whereas TB3 is for RS-232. TB2 can be used in the same manner as TB1.

When TB2 (Com-2) is setup to be used for RS-422/485, then TB3 cannot be used for RS-232, and vice-versa. The reason for this is that there is a jumper (LK11) that needs to be properly set that will tell the controller which of the two ports will be used (either TB2 as RS-422/285 OR TB3 as RS-232).

COM-3 DESCRIPTION

Com-3 (PL6) is used for RS-232 hardware protocol only, and can be used in addition to any of the other communications ports that may be being used. So it is possible to have two RS-232 ports active (Com-2 AND Com-3) at the same time, as well as Com-1 for RS-422/485.

RS-232 DESCRIPTION

RS-232 is by far the most common (and oldest) communications hardware protocol, as almost all laptop and desktop computers will have at least one RS-232 serial communications port available. It was initially developed for the emerging computer industry in the 1960's. Originally, it was a method of sending data from a mini or main frame computer, to devices such as printers, punch card readers, teletypes, magnetic tape units and modems. In those early days, the maximum speed at which RS-232 was capable of transmitting (about 9600 bits per second), was quite satisfactory, as most of the receiving devices were mechanical in nature (except for modems), and barely able to keep up with these speeds.

RS-232 uses single ended TX (transmit data) and RX (receive data). This means a common ground wire is shared between TX and RX, so only 3 wires are needed or a data only serial channel: TX, RX, and GND.

Disadvantages of single ended signaling is that it is more susceptible to noise than differential signaling (RS-422/485), effective cable distances are shorter (typically about 50 Ft. total, due to low noise immunity) and data rates are slower. Additionally, there is the limitation that only two devices can communicate together (master and slave).

The Quantum™ controller has two RS-232 ports available. One of these is TB2 (Com-2), the other is PL6 (Com-3). Both TB2 (Com-2) and PL6 (Com-3) may be used concurrently.

RS-232 signals cannot be connected directly to either an RS-422 or RS-485 device. These signals must first be conditioned (converted). See the section entitled ***Converting an RS-232 Signal to RS-422/485*** for details.

RS-422/RS-485 DESCRIPTION

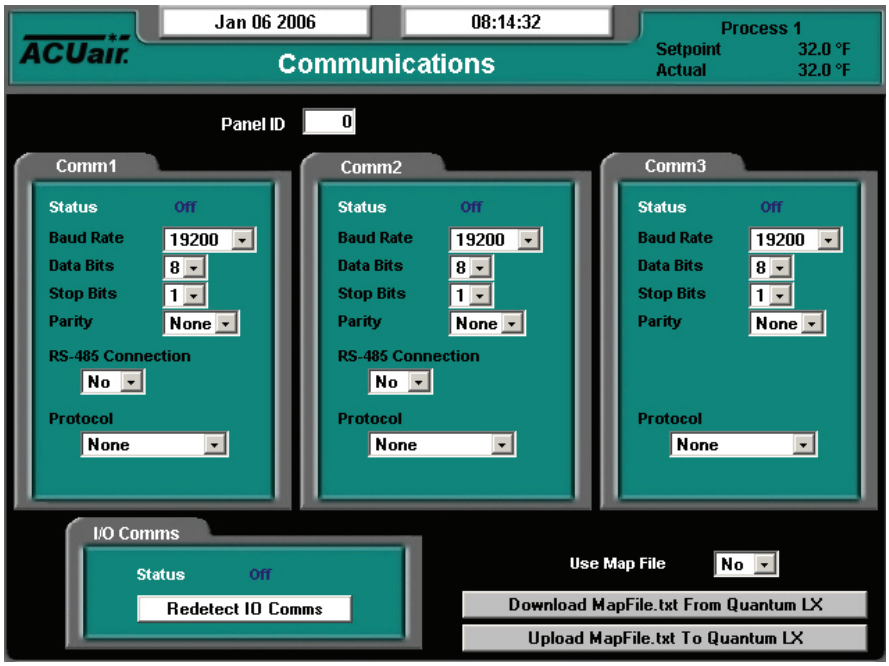
When serial communications started moving into the industrial environment, it was quickly noted that because of the high electrical noise potential from electric motors, valves, solenoids, fluorescent lighting, etc., that the noise immunity characteristics of RS-232 protocol was grossly lacking. Additionally, the distances between the communicating equipment on the factory floor was much greater than that within the typical office environment. For these reasons, RS-422 and RS-485 was developed.

- RS-422 is a full duplex communications hardware protocol. This means that it data can be sent and received simultaneously. Frick® Controls uses a 4-wire system for RS-422 (two transmit wires and two receive wires). Advantages of RS-422 over RS-232 is that up to 30 Quantum™ controllers may be simultaneously connected using a daisy-chain wiring scheme (to be explained later), and that the distances involved can be much greater (typically up to 2000 ft. for the total cable run), much greater noise immunity than RS-232.
- RS-485 is a half duplex bus. This means that it can only send or receive data at any given time. It cannot do both at the same time. Frick® Controls uses a 2-wire system for RS-485 (one positive transmit / receive wire and one negative transmit / receive wire). Up to 30 Quantum™ controllers may be simultaneously connected up to a total distance of 2000 ft. using a daisy-chain wiring scheme (to be explained later). One advantage to using RS-485 as opposed to RS-422 is that only a single twisted pair cable need to be run to all devices (while RS-422 requires a double twisted pair cable). Additionally, the RS-485 and RS-422 protocols have much greater noise immunity than RS-232.

RS-422/RS-485 signals cannot be connected directly to an RS-232 device. These signals must first be conditioned (converted). See the section entitled ***Converting an RS-232 Signal to RS-422/485*** for details.

COMMUNICATIONS SETUP

After the communications wiring has been connected, and jumpers correctly set, the LX software needs to be setup to match that of the device(s) that it is to communicate with. The following screen is where this information can be found:



ACCESSING: → Setpoints... → Communications

DESCRIPTION: This screen allows the user to assign and setup serial communications parameters.

The following setpoints are provided:

Panels ID - A number that is used by an external communications application, to converse to an individual Condenser/Vessel Unit. On interconnected systems, this number must be unique. Valid values are from 1 – 99.

Comm1 - (Setup parameter definitions for Com-1 and Com-2 are identical) Communications related information for the communications ports:

Status - Shows the current communications status of the port. The possible messages are:

- **Off** - No communications are currently taking place. NOTE: A delay of 15 seconds or more of inactive communications (time between valid responses) will cause this message to display.
- **Active** - Valid communications are actively occurring.
- **Failed** - An invalid command was received by the port. This could be due to a bad checksum value, a wiring issue, or hardware problem at either the transmitting (host) or receiving (Quantum™ LX) end.

Baud Rate - The baud rate defines the speed at which external communications can occur. The higher the baud rate, the faster the communications. The faster the baud rate, the more susceptible to external EMF. It is best to start out using a lower baud rate, and increasing the value only after verifying that communications errors do not occur. If errors start to occur, drop the baud rate back down. A pull down menu is provided to select from the following:

- 1200
- 2400
- 4800
- 9600
- 19200
- 38400
- 57600
- 115200

Data Bits - Determines the number of bits in a transmitted data package. A pull down menu is provided to select from the following:

- 7
- 8

Stop Bits - A bit(s) which signals the end of a unit of transmission on a serial line. A pull down menu is provided to select from the following:

- 1
- 2

Parity - In communications, parity checking refers to the use of *parity bits* to check that data has been transmitted accurately. The parity bit is added to every data unit (typically seven or eight data bits) that are transmitted. The parity bit for each unit is set so that all bytes have either an odd number or an even number of set bits. Parity checking is the most basic form of error detection in communications. A pull down menu is provided to select from the following:

- None
- Even
- Odd

RS-485 Connection - This defines to the Quantum™ LX the type of hardware that it will be communicating to. This selection does not apply to Com-3, as it is dedicated to RS-232 communications only. A pull down menu is provided for Com-1 and Com-2 to select from the following:

- **Yes** – This port will be connected to an RS-485 device.
- **No** – This port will not be connected to an RS-485 device. It will be using RS-422. If Com-2 is setup through jumper 11 to use RS-232, then this setting will be ignored.

Protocol - A protocol is the special set of rules that each end of a communications connection use when they communicate. A pull down menu is provided to select from the following Frick recognized protocols:

- None
- Frick
- ModBus ASCII
- ModBus RTU
- AB DF1 Full Duplex
- AB DF1 Half Duplex

Map File - Because the addressing scheme between the Quantum™ version 2.0x and earlier software and the Quantum™ LX version 3.0x and later software is not the same, this file was created. The map file is a conversion utility that can be used to allow a communications application that was previously written by the user under the Quantum™ version 2.0x and earlier to function properly with the Quantum™ LX by redirecting the old addresses to the new addresses (see the section entitled ***Using the MAP file*** for additional information). A pull down menu is provided to select from the following:

- **No** - Do not use map file, the user is either not going to be using external communications, or they will be writing the communication application based upon the Quantum™ LX addresses.
- **Yes** - The user has an application that was previously written for the Quantum™ version 2.0x or earlier, and they want to utilize the same code for the Quantum™ LX.

I/O Comms - A status indicator is provided to show the current state of the internal communications of the I/O boards. The possible displayed states are:

- **Off** - Loss of or intermittent communications failures to the internal Quantum™ LX I/O boards.
- **Active** - Indicates that normal I/O communications are occurring.
- **Failed** - Loss of communications, a shutdown message will be generated.

Redetect IO Comms - Select this key to detect all connected Analog and Digital boards. If a board has been removed, a communication error shutdown will be issued until this key is selected. Reference the ***About*** screen to view what has been detected.

USING THE MAP FILE

The MAP file is simply a text file (Mapfile.txt), which can be downloaded from the Quantum™ panel. The file can be used in its original format, which contains a limited number of addresses, or may be modified by the user, to incorporate additional addresses.

Downloading The Map File From The Quantum™ LX Through a Web Browser

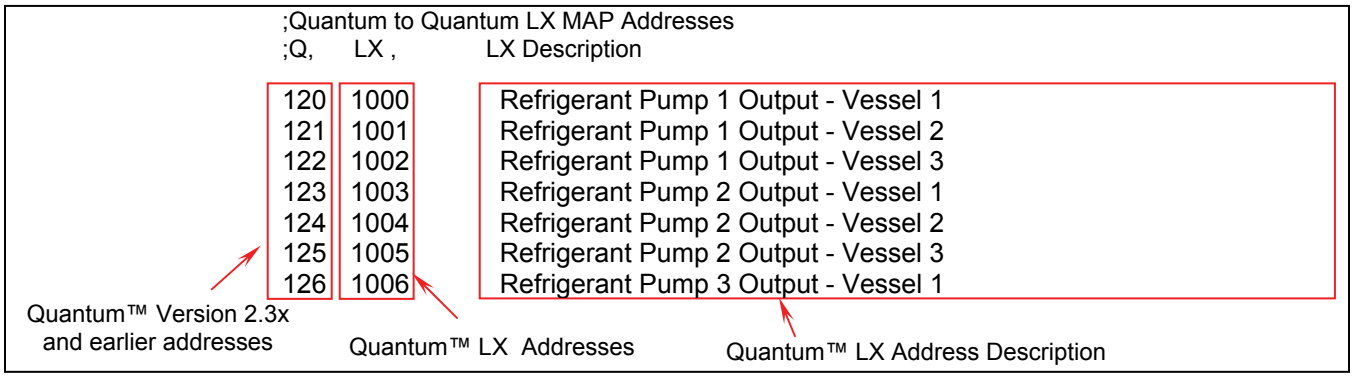
To download the map file from the Quantum™ LX controller, click the Download button. A new box will appear with a link labeled *MapFile.txt*. Right click on the link, and select *Save Link Target As...* from the menu. The web browser will then present a dialog box allowing the user select a location on their computer for the map file to be stored. (NOTE: This operation is not intended to be performed from the Operator Interface Panel. Instead, a desktop computer should be used to access the Evaporator controller via a web browser).

Downloading the MAP File From the Panel Using a USB Memory Stick

Two keys are located at the bottom right hand side of the screen. The following describes there function:

Download MapFile.txt from Quantum™ LX – With a USB memory stick installed on the LX, pressing this key will cause the MapFile.txt file to be downloaded from the Quantum™ LX into the USB memory.

Upload MapFile.txt to Quantum™ LX – After the user has modified the MapFile.txt file to suit their needs, pressing this key will cause the file to be uploaded from the USB memory back into the Quantum™ LX.



MapFile.txt Example

COMMUNICATION SETUP TABLE

Use the following form to record all settings:

TABLE 1 – COMMUNICATION SETUP

Compressor ID	_____ (0 - 99)		
	Com 1	**Com 2**	**Com 3**
Baud Rate	☐ 1200 ☐ 2400 ☐ 4800 ☐ 9600 ☐ 19200 ☐ 38400 ☐ 57600 ☐ 115200	☐ 1200 ☐ 2400 ☐ 4800 ☐ 9600 ☐ 19200 ☐ 38400 ☐ 57600 ☐ 115200	☐ 1200 ☐ 2400 ☐ 4800 ☐ 9600 ☐ 19200 ☐ 38400 ☐ 57600 ☐ 115200
Data Bits	☐ 7 ☐ 8	☐ 7 ☐ 8	☐ 7 ☐ 8
Stop Bits	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2
Parity	☐ None ☐ Even ☐ Odd	☐ None ☐ Even ☐ Odd	☐ None ☐ Even ☐ Odd
RS-485 Connection	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
Protocol	☐ None ☐ Frick ☐ Modbus ASCII ☐ Modbus RTU ☐ AB DF1 Full Duplex ☐ AB DF1 Half Duplex	☐ None ☐ Frick ☐ Modbus ASCII ☐ Modbus RTU ☐ AB DF1 Full Duplex ☐ AB DF1 Half Duplex	☐ None ☐ Frick ☐ Modbus ASCII ☐ Modbus RTU ☐ AB DF1 Full Duplex ☐ AB DF1 Half Duplex

ETHERNET AND NETWORKING

DESCRIPTION

Frick® Controls uses Ethernet as the primary method of connecting one or multiple Quantum™ LX panels to a common computer network. In the past, this interconnection would have been done by serial protocol wiring, such as RS-232/422/485. But with the capabilities of today's technology, Ethernet is the quickest and most efficient way of providing this interconnectivity.

Whereas the old serial communications methods (RS232, etc.) were slow by today's standards (kilobits per second transmission speed), Ethernet is available in two speeds: 10 Mbps and 100 Mbps.

> **NOTE:** For connection examples, refer to the section of this manual entitled *Quantum™ LX Local Ethernet Configurations* and *Quantum™ LX Ethernet Network Configurations.*

Ethernet is a data and information sharing system. To put it simply, it is a method of connecting one computer to many others on a common network. This network can consist of both hardwired connections, and wireless devices, hence the name *ETHERNET*.

Any Windows or Linux based computer is capable of accessing this network. All that is needed is either a modem, USB port, or an Ethernet port. These devices provide the necessary point of connection for one end (branch) of the connection (a home computer for instance). The other point that completes the connection is usually provided by an *I*nternet *S*ervice *P*rovider (or *ISP*). The Internet Service Provider usually has a very large network router, or means of bring in many individual connections. The router then assigns a discrete and individual address to each connection (much like a street address). This address is known as an Internet Protocol address (IP). The IP address consists of a series of 4 to 12 digits, and is normally transparent to the end user.

For those individuals familiar with using the internet, they are familiar that every time they activate their web browser (the software that allows your computer to connect), there is an address bar that appears near the top of the screen. This address bar is where you would enter the IP address of the computer or network that you would like to communicate with. To make this simpler, these numeric IP addresses are also coded to allow alpha-numeric names to be masked over them, so that rather than having to enter an address of 216.27.61.137, you can simply enter in *www.jci.com*, as an example. Although the actual process is more detailed and complicated than this basic explanation, the end result is that most of the work is being done invisibly.

The following write up describes how to set up the Quantum™ LX to do this *behind the scenes* work, so that it can communicate both at the Internet level, and at a local Ethernet level.

CABLING

Each Quantum™ LX Ethernet connection must be individually cabled (known as a *homerun*) direct from a switch or computer. Unlike RS422/485 communications which allowed for cable daisy-chaining, Ethernet connections do not allow this.

This type of cabling is designed to handle the 100-Mbps speed needed by Ethernet. Both ends of each cable must have an RJ-45 connector attached. The RJ-45 connector looks similar to the RJ-11 connector on the end of a telephone cord but is slightly larger (and not compatible). You can buy Cat 5 cables in predetermined lengths with the connectors already attached (for short runs), or you can buy the cable in rolls, cut it to length and install the RJ-45 connectors to the ends (up to 100 meters per each cable run).

Although Frick® Controls recommends the use of shielded, twisted pair Cat 5 cable, if the cable is not properly constructed and tested, it can actually be more detrimental to the network than unshielded cable. As long as all of the cables that are used have been properly constructed AND tested, either shielded or unshielded are acceptable. This is mostly due to the excellent (electrical) noise immunity that is inherent with Ethernet componentry.

> **NOTE:** Follow standard networking procedures for the interconnections of all components. For individual cable runs in excess of 300 feet (~100 meters), a *Switch*/*Hub* must be used for each additional run.

Cabling Do's and Don'ts – Frick® Controls recommends the following guidelines when installing and using CAT 5 Ethernet cable:

Do:

- Do run all cables in a star (homerun) configuration.
- Do keep all individual cable lengths under 300 feet. If greater distances are needed, use a switch/hub every 300 feet.
- Do ensure that the twists of the wire pairs within the cable are maintained from end to end.
- Do make gradual bends in the cable. Keep each bend radius over one inch.
- Do keep all cables tie wrapped neatly.

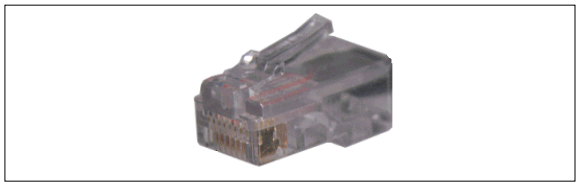
- Do try to maintain parallel cable runs where possible.
- Do keep the cable as far away as possible from EMI sources (motors, transformers, solenoids, lighting, etc.)
- Do label the ends of each cable, to facility troubleshooting and identifying in the future.
- Do test each individual cable run with an approved CAT5 E cable tester. A TONING alone test is NOT acceptable.
- Do use rubber grommets anywhere that the cable enters through a hole in a metal panel.
- ALWAYS obey local, national and fire building codes.

Don't:

- Don't install cable taut, cables must always have some "play" or slack in them.
- Don't over-tighten cable ties.
- Don't splice a cable. If a break occurs, or the length is not long enough (under 300 feet), replace the entire run with an intact length.
- Don't tie cables to electrical conduits.
- Don't strip more than one inch from the end of each cable when installing end connectors.
- Don't sharply bend or kink the cable.
- Don't mix 568A and 568B wiring at the same installation. 568B is the most common wiring.
- Don't use excessive force when pulling cable.

RJ-45 CONNECTORS

Ethernet network cables require the use of industry standard RJ-45 plugs as shown below, for the termination of all cables:



Typical RJ-45 Connector

When looking at this connector, pin 1 is at the left, and pin 8 is at the right.

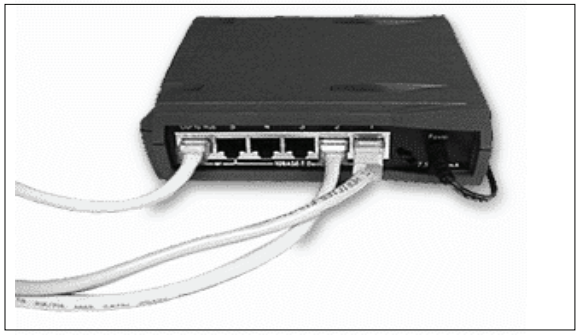
THE HUB

A Hub is a common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN (Local Area Network). They also contain multiple ports. When a data packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.

THE SWITCH

Network Switches look nearly identical to hubs, but a switch generally contains more intelligence than a hub. Unlike hubs, network switches are capable of inspecting the data packets as they are received, determining the source and destination device of a packet, and forwarding that packet appropriately. By delivering messages only to the connected device that it was intended for, network switches conserve network bandwidth and offer generally better performance than hubs.

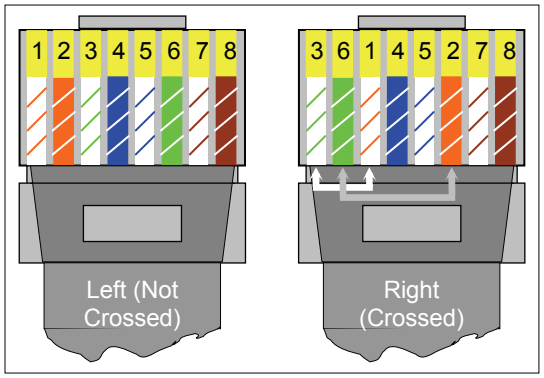
The Switch takes the signal from each computer/Quantum™ LX and sends it to all of the other computers/LX panels in your plant or office. Switches come in several sizes, noted by the number of ports available -- a four-port Switch can connect four computers, an eight-port Switch can connect up to eight computers and so on. So, if you start with a four-port Switch but eventually add more panels, you can buy another Switch and connect it to the one you already have, increasing the potential number of panels on your network.



Typical Switch

Note: If you want to connect one computer to one Quantum™ LX, you can avoid the switch and use a crossover Cat 5 cable. With a crossover cable, you directly connect one Ethernet device to the other without a Switch. To connect more than two you need a Switch.

Refer to the following pictorial to construct a crossover cable:



Both Ends of a crossover-cable

CAT-5 Ethernet cable color codes

1 – White w/orange stripe
2 – Orange w/white stripe
3 – White w/green stripe
4 – Blue w/white stripe
5 – White w/blue stripe
6 – Green w/white stripe
7 – White w/brown stripe
8 – Brown w/white stripe

Because of the large number of possible configurations in an Ethernet network, you most likely will not have any type of automated installation software. This means that you will need to manually configure all the options. To configure these options for the Quantum™ LX, please refer to the next section in this manual entitled ***Ethernet Setup***.

ETHERNET COMPONENT RECOMMENDATIONS

Component	Description	Part Number	Manufacturer
Cable	Shielded solid 4-pair* (1000 Ft)	BOXCAT5E-DSSO	Cablesforless.com
	Shielded solid 4-pair*	E-PLG-SOLID-SH	VPI
		CR45-100S	Cables Direct
		9504 CS	Alpha Wire Co.
	Un-shielded solid 4-pair**	9504 F	
		E-PLG-SOLID	VPI
	Un-shielded solid 4-pair** (1000 Ft)	345U5-1000BLK	Ram Electronics
		0-5EPCS-BK	Computercablestore.com
Crimp Tool	RJ-45 Crimp tool	HT-210C	Cablesforless.com
		P-15027	Stonewall Cable, Inc.
		S2307692	Computers4sure.com
		10-RJ1145	Computercablestore.com
Connectors	RJ-45 For Shielded 4-pair solid wire cable	P-15007	Stonewall Cable, Inc.
	RJ-45 For Un-shielded 4-pair solid wire cable	5-554169-3	Tyco Electronics
		1-5E45-010	Computercablestore.com
		P-15029	Stonewall Cable, Inc.
Cable Tester	Ethernet Cable Tester – Continuity only	TST-5150	Cablesforless.com
		TS075A-R2	Black Box
	Complete Cable I/O Qualification Tester	N/A	Fluke
Switches	5 RJ-45 port	SFN-5TX	Phoenix
	7 RJ-45 Port and 1 ST Fiber Optic Port	SFN-7TX/FX ST	Phoenix
	8 RJ-45 port	SFN-8TX	Phoenix

* STP = Shielded Twisted Pair
** UTP = Unshielded Twisted Pair

Ethernet

Ethernet is a data and information sharing system. To put it simply, it is a method of connecting one network to another (and another, and so on). These networks can be inter-connected, either by cable (Cat-5) or through wireless communications, hence the name Ethernet.

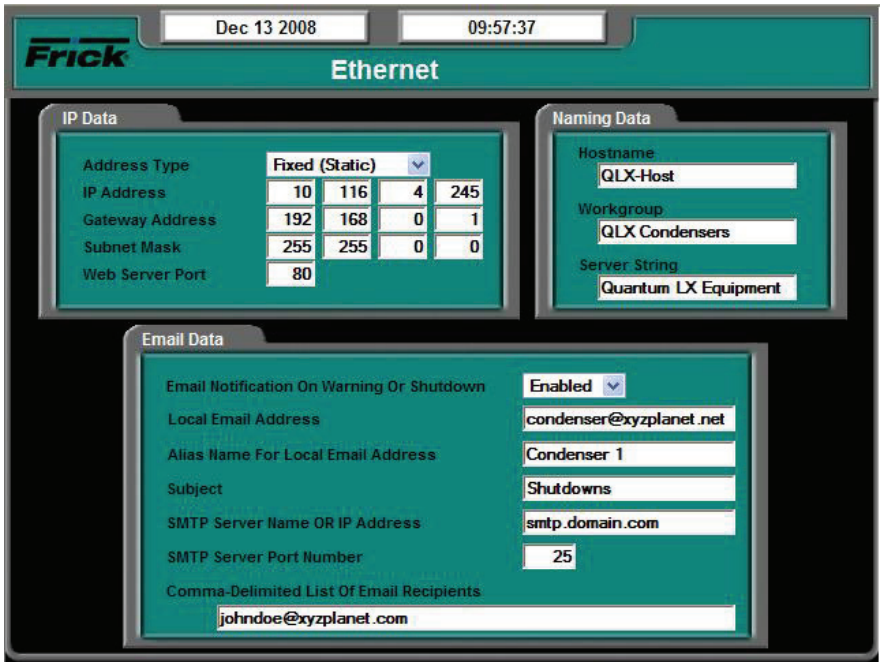
Any Windows or Linux based computer is capable of accessing this network. All that is needed is either a modem, USB port, or an Ethernet port. These devices provide the necessary point of connection for one end (branch) of the connection (a home computer for instance). The other point that completes the connection is usually provided by an *I*nternet *S*ervice *P*rovider (or *ISP*).

The Internet Service Provider usually has a very large network router, or means of bring in many individual connections. The router then assigns a discrete and individual address to each connection (much like a street address). This address is known as an Internet Protocol address (IP). The IP address consists of a series of 4 numbers ranging from 0 t0 255, and is normally transparent to the end user. For those individuals familiar with using the internet, they understand that every time they activate their web browser (the software that allows your computer to connect), there is an address bar that appears near the top of the screen. This address bar is where you would enter the IP address of the computer or network that you would like to communicate with. To make this simpler, these numeric IP addresses are also coded to allow alpha-numeric names to be masked over

them, so that rather than having to enter an address of 216.27.61.137, you can simply enter in *www.frickcold.com*, as an example. Although the actual process is more detailed and complicated than this basic explanation, the end result is that most of the work is being done invisibly, and the end user in not even aware of how it all works, nor do most people care. The following write up describes how to set up the Quantum™ LX to do this *behind the scenes* work, so that it can communicate both at the Internet level, and at a local Ethernet level.

Ethernet Setup

The following section describes the suggested setup for connecting the Quantum™ LX panel to the customers Ethernet:



Configuration … → Ethernet

ACCESSING:

DESCRIPTION: This screen is used to allow the user to assign and setup Ethernet and Email communications parameters.

IP DATA

Address Type - The following drop-down menu is provided:

- **Fixed** (Static) – A fixed address is usually assigned by the network (LAN) administrator, and is normally always the same.
- **DHCP** (Dynamic) – **D**ynamic **H**ost **C**onfiguration **P**rotocol permits auto-assignment of temporary IP addresses for new devices connecting to the network.

IP Address – (Internet Protocol) Four setpoint boxes are provided here. Every machine on an Internet or Ethernet network must be assigned a unique identifying number, called an IP Address (this is similar in concept to the Quantum™ LX panel ID number). The IP address is how the network identifies each device that is attached. A typical IP address would look like this:

- 216.27.61.137

Gateway Address – Four setpoint boxes are provided here. This is the IP address for the computer or device onto which your local network is connected to. This gateway device allows data to be routed to other gateways and networks. A router is a Gateway device that routes packets between different physical networks. A gateway is a network point that acts as an entrance to another network.

Subnet Mask - A TCP/IP number used to determine to which TCP/IP subnet a device belongs. Devices in the same subnet can be communicated with locally without going through a router When a TCP/IP device tries to communicate with another device the bits of the TCP/IP destination address are "ANDed" with the subnet mask to determine whether the address is a local address (broadcastable) or must be reached through a router. A subnet mask of 255.255.255.0 used by a computer with a TCP/IP address of 10.10.10.1 would include the addresses 10.10.10.0 through 10.10.10.255 in the local network basically telling the computer to try a router if it's transmitting

to any other IP address. This is all part of the TCP/IP protocol

Web Server Port – This is the port, or channel, that a web server uses to communicate through. Just as a computer sends data to a printer through a printer port, a web server sends and receives data through the web server port. By default, the port number for a web server is 80.

NAMING DATA

NOTE: The IP Address Type must be set to DHCP (Dynamic) for this section to work.

Host Name – Enter here a distinct name that you wish to be able to identify this particular compressor by (for example; Unit1). The Host Name can be up to fifteen characters in length, and must consist exclusively of letters and numbers (spaces are not permitted). It is similar in concept to the function of the Panel ID, and basically allows the network router to interpret the actual IP address of a particular unit as this host name. When using a web browser within the system network, this name can be entered as the web location that you wish to visit (instead of having to type in the IP address). After modifying a Host Name, you will be required to cycle power. The network router could take up to fifteen minutes to recognize the change.

Work Group – All of the Quantum™ LX units within a network may be grouped into different categories. These categories could be unit locations, or perhaps categorized by unit function. So name each unit by these functional Work Group names. The Work Group name must be fifteen characters or less in length, and can use numerals and upper and lower case letters. When using the network neighborhood feature of Windows® Internet Explorer, and look at your Network Neighbor hood, you would see the name of the Work Group, and within that work group you would see the individual Host Names of each unit within that work group. After modifying a Work Group name, you will be required to cycle power. The network router could take up to fifteen minutes to recognize the change.

Server String – This is a comment area that can be used in conjunction with the Host Name. For example, if the Host Name is *Booster1*, you could set the Server String to print something like *DockBooster*, or some other additional information about the unit. The Server String has no control function, it is strictly a descriptive field.

E-MAIL DATA

The purpose of the email data feature is to allow the controller to send a warning or shutdown message to defined listing of recipients.

Email Notification On Warning Or Shutdown – For the email notification feature to work, it must be enabled (it is disabled as a default). The following drop-down menu is provided:

- Disabled
- Enabled

Local Email Address - Use this setpoint box to enter a valid email address that has been assigned to the internet account.

Alias Name For Local Email Address – Enter here a custom name to identify more clearly the local email address. When a message is sent to all recipients, this is the name that will appear in the email *FROM* column.

Subject - Enter here a custom subject that you would like to have appear when a failure message is sent. When a message is sent to all recipients, this is the wording that will appear in the email *SUBJECT* field.

SMTP Server Name OR IP Address - SMTP stands for **S**imple **M**ail **T**ransfer **P**rotocol. **SMTP** servers handle outgoing email, and accept email from other domains. When you set up an email client, you must specify an *outgoing server* (sometimes called an *SMTP server*). Often, this server is designated in the form of smtp.domain.com. But this can vary, so be sure to check with your email service provider or LAN administrator to find out their outgoing server.

SMTP Server Port Number - This value is in almost all cases going to be 25. This should be set by the network or LAN administrator.

Comma-Delimited List Of Email Recipients - This is simply the list of the Email addresses that you would like to have messages sent to. Separate each email address with a comma.

PROTOCOL

The use of communication protocols permit data transmission between devices. Protocols determine how contact is established and how the query (question) and response (answer) takes place. The information in a message command requires an identity of the intended receiver (ID #), what the receiver is to do (read or write to a setpoint, etc.), data needed to perform an action (the value of a setpoint to be changed), and a means of checking for errors (checksum).

When using any of the communication ports, check what communication protocol, if any has been selected, from the ***Communications*** screen. The baud rate, data bits, stop bits, parity and connection type of all comm. ports, as well as the panel ID number are also changed from this screen, and should coincide with the setup of the other device.

Note: The data communication protocols are continuously being expanded and improved. Therefore, you should consult Frick® Controls for the exact details on your particular unit(s) before developing system software to interface with the panel.

Quantum™ Communications Protocols

The Quantum™ LX controller has the capability of communicating to the outside world through the following software protocols:

- Frick®
- Modbus ASCII
- Modbus RTU
- Allen-Bradley

Checklist For Setting Up Communication

1. Decide which Quantum™ protocol you can communicate with and want to use.
2. Setup your device's communication port with the proper parameters and select a baud rate.
3. Next, setup the Quantum™ for the desired communication protocol. Select the protocol from the ***Communications*** screen.
4. Setup the baud rate of the comm port to coincide with the setup of your device's communication port.
5. Enter the Quantum™ ID. This will be used to identify commands that are sent to it.
6. Wire to the first panel via RS-232, RS-422, or RS-485 connections to the Quantum™ Comm Port.
    - If you are communicating to more than one panel, then you will not be able to use RS-232. You can however, convert RS-232 to either RS-422 or RS-485 with an adapter card. Reference the *Converting an RS-232 Serial Port to RS-422 or RS-485* section for information about an adapter card.
    - Reference the drawing of the *Quantum™ Main Board* in this manual to identify wiring and jumpering locations for the Comm Ports.
    - Reference the *Main Board Communications* section in this manual for the correct jumpering of RS-232, RS-422, or RS-485.
7. Send a single command to read data from this Quantum™ using its ID.
8. Check if you received a data response at your device.
9. Troubleshooting when you don't receive a data response:
    - Check to see if the status of the Comm Port on the ***Communications*** screen is showing *ACTIVE* or *OFF*.
    - *ACTIVE* is shown only when the Quantum™ has received a properly composed message..
    - Check that the RX2 I/O communication activity lamp on the Quantum™ Main Processor Board is blinking as it receives the instruction from your device.
    - A steady lit RX2 LED or one that isn't lighting, are signs of improper wiring.
    - If the RX2 LED is properly blinking, then check if the TX2 LED is blinking in response.
    - If the TX2 is not blinking then check the communication protocol setup at the panel, the panel's ID and the comm port baud rate setting.
    - If the TX2 is blinking, then check that the Comm Port communication jumpers are correct.

Note: A useful tool for troubleshooting is Windows *HyperTerminal*. Using HyperTerminal can help you determine if the system is wired properly. Reference the *HyperTerminal Setup* section in this manual.

1 If you properly receive data and you need to communicate to more than one panel, then setup and wire to another panel. Reference the wiring diagram drawings in the back of this manual. Send a single command to read data from this Quantum™ using it's ID and troubleshoot as above, if necessary. To prevent noise feedback which is possible when communicating over a long distance, only the last panel should have the termination for long communications lines jumpered.

Frick Protocols

All commands for Frick protocols must be in ASCII format to function properly. The data should be setup as an 8-bit Word, with either no Parity or even Parity, and a Stop Bit. The commands must be entered in upper case letters. A Condenser or Vessel with an ID code of **[00]** is considered disabled. ID codes from **[01]** through **[99]** are valid and recognized by the microprocessor.

Quantum's Protocol Specifications

Quantum™ ("$") protocol commands have been added specifically for the Quantum™. Unless otherwise shown, 9 characters are returned from the Quantum™ for a data value. The data value includes two decimal fields and the first character position is either; "-" if the value is negative, or it is "+" if the value is positive. For example, if the data's value is 25.5; then the value +00002550 is sent. All temperatures are in degree C and all pressures are in PSIA. A mode such as Condenser Mode (Summer / Winter) is returned as an integer value that represents the mode it is in. For example, a +00000000 is sent if it is in summer, or a +00000100 is sent if it is in winter. The value +00000000, which is received as a 0 (zero), is used to represent an "OFF" status and a "DISABLED" option. The value +00000100, which is received as a 1 (one), is used to represent an "ON" status and an "ENABLED" option. Setpoints are only changed if the value sent is within the acceptable range. The checksum is the 2 byte hexadecimal sum of each character within the command or returned answer excluding the command type identifier, "$". If the command's checksum is replaced with "??", the Quantum™ returns a response without using checksum error detection on the received command. If the Quantum™ detects a checksum error, a "N" (Not Acknowledged), the Condenser or Vessel ID code, "02", Carriage return, and Linefeed are returned.

The following is a complete list of available Frick® Protocol # commands:

COMMAND CODE and DESCRIPTION
F1 = Alarms/Shutdowns Annunciation Page 1.
F2 = Alarms/Shutdowns Annunciation Page 2.
F3 = Alarms/Shutdowns Annunciation Page 3.
CA = Clear Alarms
T1 = Read a value from the Table.
CS = Change a setpoint in the Table.
IC = Condenser Current Status
IV = Vessel Current Status

All data is returned as integer values. If decimal positions are assumed, then divide the data by the proper multiple of 10 to get the actual value.

Temperature data is returned in the current temperature units as degrees C, and all pressures in PSIA. However, all temperatures and pressures can be configured to return values in the prescribed Panel Units. This change can be made by setting address 4566 to 1 (Panel Units). The Panel Units can be accessed through the user interface by selecting ***Menu*** > ***Session***. Data is returned in the current temperature units as 3 characters with no decimal position (i.e. 032 would represent 32 degrees Fahrenheit if the panel temperature units are in Fahrenheit, or it would represent 32 degrees Celsius, if the panel temperature units are in Celsius).

RETURN Alarms & Shutdowns - Page 1 data: $01F1

Command structure:

Command	Description
$	Start of command sequence.
xx	Quantum ID code.
F1	Failure Annunciation command Page 1.
1	Unit ID (1 = Condenser, 2 = Vessel)
CS	Checksum
CR	Carriage Return

RETURNED ANSWER,

Character Position	Description of returned data
1	A = Acknowledge
2-3	xx = Quantum ID code
4-6	Message Code 1
7-14	Date 1 as mm/dd/yy
15-22	Time 1 as hh:mm:ss
23	Space
24-26	Message Code 2
27-34	Date 2 as mm/dd/yy
35-42	Time 2 as hh:mm:ss
43	Space
44-46	Message Code 3
47-54	Date 3 as mm/dd/yy
55-62	Time 3 as hh:mm:ss
63	Space
64-66	Message Code 4
67-74	Date 4 as mm/dd/yy
75-82	Time 4 as hh:mm:ss
83	Space
84-86	Message Code 5
87-94	Date 5 as mm/dd/yy
95-102	Time 5 as hh:mm:ss
103	Space
104-106	Message Code 6
107-114	Date 6 as mm/dd/yy
115-122	Time 6 as hh:mm:ss
123	Space
124-127	CS (Checksum followed by Carriage return, Line feed.)

RETURN Alarms & Shutdowns - Page 2 data: $01F2

Command structure:

Command	Description
$	Start of command sequence.
xx	Quantum ID code.
F2	Failure Annunciation command Page 2.
1	Unit ID (1 = Condenser, 2 = Vessel)
CS	Checksum
CR	Carriage Return

RETURNED ANSWER,

Character Position	Description of returned data
1	"A" Acknowledge
2-3	"01" Quantum ID code.
4-6	Message Code 7
7-14	Date 7 as mm/dd/yy
15-22	Time 7 as hh:mm:ss
23	Space
24-26	Message Code 8
27-34	Date 8 as mm/dd/yy
35-42	Time 8 as hh:mm:ss
43	Space
44-46	Message Code 9
47-54	Date 9 as mm/dd/yy
55-62	Time 9 as hh:mm:ss
63	Space
64-66	Message Code 10
67-74	Date 10 as mm/dd/yy
75-82	Time 10 as hh:mm:ss
83	Space
84-86	Message Code 11
87-94	Date 11 as mm/dd/yy
95-102	Time 11 as hh:mm:ss
103	Space
104-106	Message Code 12
107-114	Date 12 as mm/dd/yy
115-122	Time 12 as hh:mm:ss
123	Space
124-127	CS (Checksum followed by Carriage return, Line feed.)

RETURN Alarms & Shutdowns - Page 3 data: $01F3

Command structure:

Command	Description
$	Start of command sequence.
xx	Quantum ID code.
F3	Failure Annunciation command Page 3.
1	Unit ID (1 = Condenser, 2 = Vessel)
CS	Checksum
CR	Carriage Return

RETURNED ANSWER,

Character Position	Description of returned data
1	"A" Acknowledge
2-3	"01" Quantum ID code.
4-6	Message Code 13
7-14	Date 13 as mm/dd/yy
15-22	Time 13 as hh:mm:ss
23	Space
24-26	Message Code 14
27-34	Date 14 as mm/dd/yy
35-42	Time 14 as hh:mm:ss
43	Space
44-46	Message Code 15
47-54	Date 15 as mm/dd/yy
55-62	Time 15 as hh:mm:ss
63	Space
64-66	Message Code 16
67-74	Date 16 as mm/dd/yy
75-82	Time 16 as hh:mm:ss
83	Space
84-86	Message Code 17
87-94	Date 17 as mm/dd/yy
95-102	Time 17 as hh:mm:ss
103	Space
104-106	Message Code 18
107-114	Date 18 as mm/dd/yy
115-122	Time 18 as hh:mm:ss
123	Space
124-127	CS (Checksum followed by Carriage return, Line feed.)

RETURN DATA VALUE FROM TABLE: $IDT1

Command structure:

Command	Description
$	Start of command sequence.
xx	Quantum ID code.
T1	Return the value of a Table address.
0000	Frick Address from Table (up to 16 total)
CS	Checksum
CR	Carriage Return

RETURNED ANSWER,

Character Position	Description of returned data
1	"A" Acknowledge
2-3	"01" Quantum ID code.
4-	Value(s) of requested data. CS (Checksum followed by Carriage return, Line feed.)

CHANGE SETPOINT COMMAND: $IDCS

Command structure:

Command	Description
$	Start of command sequence.
xx	Quantum ID code.
CS	Change Table address's setpoint value.
0000	Frick Table address of the setpoint.
+/- 000000000	New setpoint scaled x100.
CS	Checksum
CR	Carriage Return

RETURNED ANSWER, "A" followed by the "ID",
and 1 "CR", "LF" if successful.
and 0 "CR", "LF" if unsuccessful.

CLEAR ALARMS COMMAND: $IDCA

Command structure:

Command	Description
$	Start of command sequence.
xx	Quantum ID code.
CA	Clear Alarms
CS	Checksum
CR	Carriage Return

RETURNED ANSWER, "A" followed by the "ID",
and 1 "CR", "LF" if successful.
and 0 "CR", "LF" if unsuccessful.

RETURN Condenser Status (Info): $IDIC

Command structure:

Command	Description
$	Start of command sequence.
01	Quantum ID code.
IC	Info Condenser Status Command
CS	Checksum
CR	Carriage Return

RETURNED ANSWER,

Char. Pos.	Description of returned data				
1	A = Acknowledge				
2-3	xx = Quantum ID code.				
4-5	Info Condenser Command (IC)				
6	Digital Inputs (right to left)				**Note:** These Character Positions are in hexadecimal format (0 – F). The hex values are broken down into the bit formats as shown, and are read from right to left as: Bit 3 Bit 2 Bit 1 Bit 0
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 1	Step 2	Step 3	Step 4	
7	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 5	Step 6	Step 7	Step 8	
8	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 9	Step 10	Step 11	Step 12	
9	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 13	Step 14	Step 15	Step 16	
10	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 17	Step 18	Step 19	Step 20	
11	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 21	Step 22	Step 23	Step 24	
12	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 1	Step 2	Step 3	Step 4	
13	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 5	Step 6	Step 7	Step 8	
14	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 9	Step 10	Step 11	Step 12	
15	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 13	Step 14	Step 15	Step 16	
16	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 17	Step 18	Step 19	Step 20	

Char. Pos.	Description of returned data				
17	Digital Outputs (right to left)				Note: These Character Positions are in hexadecimal format (0 – F). The hex values are broken down into the bit formats as shown, and are read from right to left.
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 21	Step 22	Step 23	Step 24	
18	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Step 24 (Aux Input)	Alarm Output	Empty	Empty	
19-21	Analog Output Channel 1 – Variable Fan 1				
22-24	Analog Output Channel 2 – Variable Fan 2				
25-27	Analog Output Channel 3 – Variable Fan 3				
28-30	Analog Output Channel 4 – Variable Fan 4				
31-34	Analog Input Ch. 1 – Discharge Pressure (PSIA)				**Note:** These addresses have an assumed decimal place.
35-38	Analog Input Ch. 2 – Outside Air Temp. (C) *Signed value*				
39-42	Analog Input Ch. 3 – Outside Air Humidity				
43-46	Analog Input Ch. 4 – Condenser Drain Temp. (Not Used)				
47-50	Analog Input Ch. 5 – Aux 1				
51-54	Analog Input Ch. 6 – Aux 2				
55-58	Analog Input Ch. 7 – Aux 3				
59-62	Analog Input Ch. 8 – Aux 4				
63-66	Analog Input Ch. 9 – Aux 5				
67-70	Analog Input Ch. 10 – Aux 6				
71-74	Analog Input Ch. 11 – Aux 7				
75-78	Current Setpoint (PSIA)				
79	Unit Status	0 = Normal	1 = Defrost		
80	Unit Mode	0 = Summer	1 = Winter		
81	Mode Control	0 = Manual	1 = Automatic		
82	High Pressure Flag	0 = Normal	1 = High Pressure Override		
83	Low Pressure Flag	0 = Normal	1 = Low Pressure Override		
84	Low Temp. Flag	0 = Normal	1 = Low Temp Override		
85	Sensor Fault Flag	0 = Normal	1 = Condenser Pressure Sensor Fault		
86	Condenser Alarm	0 = Normal	1 = Alarm		
87-88	Checksum				
89-90	Carriage Return				

RETURN Vessel Status (Info): $IDIV

Command structure:

Command	Description
$	Start of command sequence.
01	Quantum ID code.
IV	Info Vessel Status Command
CS	Checksum
CR	Carriage Return

RETURNED ANSWER,

Char. Pos.	Description of returned data				
1	A = Acknowledge				
2-3	xx = Quantum ID code.				
4-5	Info Vessel Command (IC)				
6	Digital Inputs (right to left)				**Note:** These Character Positions are in hexadecimal format (0 – F). The hex values are broken down into the bit formats as shown, and are read from right to left.
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 1 HLSD	Vessel 1 HLA	Vessel 1 Op. Level 1	Vessel 1 Op. Level 2	
7	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 1 LLA	Vessel 1 LLSD	Vessel 1 Refrig. Pump 1	Vessel 1 Refrig. Pump 2	
8	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 2 HLSD	Vessel 2 HLA	Vessel 2 Op. Level 1	Vessel 2 Op. Level 2	
9	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 2 LLA	Vessel 2 LLSD	Vessel 2 Op. Level 1	Vessel 2 Op. Level 2	
10	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 3 HLSD	Vessel 3 HLA	Vessel 3 Op. Level 1	Vessel 3 Op. Level 2	
11	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 3 LLA	Vessel 3 LLSD	Vessel 3 Refrig. Pump 1	Vessel 3 Refrig. Pump 2	
12	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 4 HLSD	Vessel 4 HLA	Vessel 4 Op. Level 1	Vessel 4 Op. Level 2	
13	Digital Inputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 4 LLA	Vessel 4 LLSD	Vessel 4 Refrig. Pump 1	Vessel 4 Refrig. Pump 2	
14	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 1 Solenoid 1	Vessel 1 Solenoid 2	Vessel 1 Refrig. Pump 1	Vessel 1 Refrig. Pump 2	

Char. Pos.	Description of returned data				
15	Digital Outputs (right to left)				**Note:** These Character Positions are in hexadecimal format (0 – F). The hex values are broken down into the bit formats as shown, and are read from right to left.
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 2 Solenoid 1	Vessel 2 Solenoid 2	Vessel 2 Refrig. Pump 1	Vessel 2 Refrig. Pump 2	
16	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Vessel 3 Solenoid 1	Vessel 3 Solenoid 2	Vessel 3 Refrig. Pump 1	Vessel 3 Refrig. Pump 2	
17	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Digital Aux. Output 1	Digital Aux. Output 2	Digital Aux. Output 3	Digital Aux. Output 4	
18	Digital Outputs (right to left)				
	Bit 0	Bit 1	Bit 2	Bit 3	
	Digital Aux. Output 5	Digital Aux. Output 6	Digital Aux. Output 7	Digital Aux. Output 8	
19-21	Analog Out. Ch. 1 – Vessel # 1 Mod. Valve				
22-24	Analog Out. Ch. 2 – Vessel # 2 Mod. Valve				
25-27	Analog Out. Ch. 3 – Vessel # 3 Mod. Valve				
28-30	Analog Out. Ch. 4 – Analog Aux. Output 1				
31-34	Analog In. Ch. 1 – Vessel 1 Level				**Note:** These addresses have an assumed decimal place.
35-38	Analog In. Ch. 2 – Vessel 2 Level				
39-42	Analog In. Ch. 3 – Vessel 3 Level				
43-46	Analog In. Ch. 4 – Vessel 1 Pressure				
47-50	Analog In. Ch. 5 – Vessel 2 Pressure				
51-54	Analog In. Ch. 6 – Vessel 3 Pressure				
55-58	Analog In. Ch. 7 – Vessel 1 Refrig. Pump Differential Pressure				
59-62	Analog In. Ch. 8 – Vessel 2 Refrig. Pump Differential Pressure				
63-66	Analog In. Ch. 9 – Vessel 3 Refrig. Pump Differential Pressure				
67-70	Analog Input Ch. 10 – Aux. Analog 1				
71-74	Analog Input Ch. 11 – Aux. Analog 2				
79	Vessel 1 Status	0= Normal	1=Hi Level	2= Lo level	
80	Vessel 2 Status	0=Normal	1=Hi Level	2=Lo Level	
81	Vessel 3 Status	0=Manual	1=Hi Level	2=Lo Level	
82	Vessel 1 Refrig. Pump 1	0=Off	1=Running	2=Failed	
83	Vessel 2 Refrig. Pump 1	0=Off	1=Running	2=Failed	
84	Vessel 3 Refrig. Pump 1	0=Off	1=Running	2=Failed	
85	Vessel 1 Refrig. Pump 2	0=Off	1=Running	2=Failed	
86	Vessel 2 Refrig. Pump 2	0=Off	1=Running	2=Failed	
87	Vessel 3 Refrig. Pump 2	0=Off	1=Running	2=Failed	
88	Vessel Alarm	0=Normal	1 = Alarm		
89-90	Checksum				
91-92	Carriage Return				

CONVERSION CHART FOR DECIMAL / HEXADECIMAL / ASCII

Decimal (DEC)	Hexadecimal (HEX)	ASCII
0	0	ctrl @ NUL
1	1	ctrl A SOH
2	2	ctrl B STX
3	3	ctrl C ETX
4	4	ctrl D EOT
5	5	ctrl E ENQ
6	6	ctrl F ACK
7	7	ctrl G BEL
8	8	ctrl H BS
9	9	ctrl I HT
10	A	ctrl J LF
11	B	ctrl K VT
12	C	ctrl L FF
13	D	ctrl M CR
14	E	ctrl N SO
15	F	ctrl O SI
16	10	ctrl P DLE
17	11	ctrl Q DC1
18	12	ctrl R DC2
19	13	ctrl S DC3
20	14	ctrl T DC4
21	15	ctrl U NAK
22	16	ctrl V SYN
23	17	ctrl W ETB
24	18	ctrl X CAN
25	19	ctrl Y EM
26	1A	ctrl Z SUB
27	1B	ctrl [ESC
28	1C	ctrl \ FS
29	1D	ctrl] GS
30	1E	ctrl ^ RS
31	1F	ctrl _ US
32	20	SPACE
33	21	!
34	22	"
35	23	#
36	24	$
37	25	%
38	26	&
39	27	'
40	28	(
41	29	)
42	2A	*

Decimal (DEC)	Hexadecimal (HEX)	ASCII
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7
56	38	8
57	39	9
58	3A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U

Decimal (DEC)	Hexadecimal (HEX)	ASCII
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_
96	60	'
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	|
125	7D	}
126	7E	□
127	7F	DEL

Allen-Bradley Communication

To provide for the reading and writing of data to Quantum™ LX panels using Allen-Bradley communication, the Quantum™ has a Allen-Bradley DF1 communication driver that recognizes both half-duplex and full duplex SLC 500 protected typed logical read and write commands. This is a Master/Slave multi-drop communication method. The Quantum™ talks Allen-Bradley SLC protocol and is setup to be an Allen-Bradley SLC500 slave station. The customer's PLC or DCS must be setup to initiate the reading and writing of data to a Quantum™. The Quantum™ ID number is used as it's station address and the target node. With the AB PLC, the MSG (Message) instruction is used to send read and write requests. A DCS (Distributed Control System) will use a SLC 500 DF1 protocol driver to send protected typed logical read and protected typed logical write requests to a Quantum™. Fifty (50) data elements can be read with one read. The most desired data (information on the ***Home*** screen) exists in a fifty (50) element data area. Setpoints are changed by sending a write command to one element. Changing a setpoint causes the Quantum™ to save the new setpoint to Flash memory (non-volatile memory). Be careful not to continuously request a setpoint change. Keeping the Quantum™ busy writing to Flash memory may interfere with the Quantum™ communicating to it's I/O Boards. For more detail and a list of the data, reference the *Quantum™ LX Data Table* section. For details about the actual protocol, reference the AB publication 1770-6.5.16 *DF1 Protocol and Command Set Reference Manual*.

The Quantum™ can be connected to the Data Highway (DH) by wiring the Quantum™ serial port (Com-2) to a serial device on the DH such as an internal port of a PLC that supports the Data Highway protocol like the SLC 5/04. Quantum™ panels can be on a multi-drop link (wired to other Quantum™ panels). If RS-422 or RS-485 is used as in a multi-drop link, an adapter card can be used to convert an RS-232 to an RS-422 or RS-485 serial port.

Because overrun can occur, the baud rate and commands should be setup to produce the most desired throughput. The master station should have the Stop Bit set to 1, Parity set to none, Duplicate Detect disabled, and Error Detect set for BCC or CRC.

When communication is between either the programming software and a Quantum™ or an Allen-Bradley PLC and a Quantum™ on a multi-drop link, the devices depend on a DF1 Master to give each of them polling permission to transmit in a timely manner. As the number of Quantum™ slaves increase on the link, the time between when the Quantum™ is polled also increases. This increase in time may become larger if you are using low baud rates. As these time periods grow the timeouts such as the message timeout, poll timeout and reply timeout may need to be changed to avoid loss of communication.

ACK Timeout - The amount of time in 20 milliseconds increments that you want the processor to wait for an acknowledgment to the message it has sent before the processor retries the message or the message errors out.

Reply Message Wait Time - Define the amount of time in 20 millisecond increments that the master station will wait after receiving an ACK (to a master-initiate message) before polling the remote station for a reply. Choose a time that is, at minimum, equal to the longest time that a remote station needs to format a reply packet. Some remote stations can format reply packets faster than others.

Message Timeout - Defines the amount of time in seconds that the message will wait for a reply. If this time elapses without a reply, the error bit is set, indicating that the instruction timed out. A timeout of 0 seconds means that there is no timer and the message will wait indefinitely for a reply. Valid range is 0-255 seconds.

Note: Make sure the Allen-Bradley PLC and the programming software is the most recent software revision. Some revisions have been made that affect doing the SLC Typed Logical Read/Write Message Command.

SLC-500 - Suggested Setup

CHANNEL CONFIGURATION

Configure the communication channel – Channel 0:
Current Communication Mode: System
Communication Driver: DF1 Half-Duplex Master or DF1 Full-Duplex
Baud Rate: 19200 (suggested)
Stop Bits: 1
Duplicate Detect: Disabled
ACK Timeout (x20ms): 30
Message Retries: 3
Parity: None
Station Address (Source ID): 5 (Master's DF1 selected ID#)
Error Detect: BCC / CRC
RTS off Delay (x20ms): 0
RTS Send Delay (x20ms): 0
Pre-Send Time Delay (x1 ms): 0
Control Line: No Handshaking
Polling Mode: Message Based (do not allow slave to initiate messages)
Priority Polling Range - Low: 255, High: 0
Normal Polling Range - Low: 255, High: 0
Normal Poll Group Size: 0
Reply Message Wait Time (x20ms): 20
System Mode Driver: DF1 Half-Duplex Master or DF1 Full-Duplex
User Mode Driver: Generic ASCII
Write Protect: DISABLED
Mode Changes: DISABLED
Mode Attention Character: \0x1b (default)
System Mode Character: S (default)
User Mode Character: U (default)
Edit Resource/File Owner Timeout (Sec): 60
Passthru Link ID (decimal): 1

Read Message Setup Example

Read/Write Message
Type: Peer-To-Peer
Read/Write: Read
Target Device: 500 CPU
Local/Remote: Local
Control Block: N11:0
Control Block Length: 14
Channel: 0
Target Node: 2 (002) (this is Quantum's™ Panel ID)
Local File Address: N12:0
Target File Address/Offset: N10:0
Message Length in Elements: 50
Message Time-out (seconds): 15

(Refer to the Allen-*Bradley Programming Overview* Section for more information)

Write Message Setup Example

Read/Write Message
Type: Peer-To-Peer
Read/Write: Write
Target Device: 500 CPU
Local/Remote: Local
Control Block: N11:0
Control Block Length: 14
Channel: 0
Target Node: 2 (002) (this is Quantum™ Panel ID)
Local File Address: N12:0
Target File Address/Offset: N55:3
Message Length in Elements: 1
Message Time-out (seconds): 15

(Refer to the *Allen-Bradley Programming Overview* Section for more information)

PLC-5/30 - Suggested Setup

Channel 0 - 25-pin D-shell serial port; supports standard EIA RS-232C and RS-423 and is RS-422A compatible.

NOTE: Channel 0 is optically-coupled (provides high electrical noise immunity) and can be used with most RS-422A equipment as long as:

- Termination resistors are not used
- The distance and transmission rate are reduced to comply with RS-423 requirements

The PLC-5's switch 2 is used to select RS-232C, RS-422A, or RS-423. Channel 0 can be wired for RS-422.

Following is the pin connections showing how to wire the PLC-5 channel 0 connector to the Quantum™ for RS-422 communication:

PLC-5 CH0	Quantum™ Com-2
Pin 2 (TXD.OUT+)	Pin 1 (-RX)
Pin 3 (RXD.IN+)	Pin 3 (-TX)
Pin 14 (TXD.OUT-)	Pin 2 (+RX)
Pin 16 (RXD.IN-)	Pin 4 (+TX)

Channel 0 Setup:

Port	Maximum Cable length
RS-232C	15 m (50 ft)
RS-422A	61 m (200 ft)
RS-423	61 m (200 ft)

Important guidelines:

- When channel 0 is configured for RS-422A compatibility, do not use terminating resistors anywhere on the link.
- When channel 0 is configured for RS-422A (compatible) and RS-423, do not go beyond 61 m (200 ft). This distance restriction is independent from the transmission rate.

CHANNEL CONFIGURATION

Channel 0 = System (Master) for half-duplex or System (Point-To-Point) for full-duplex
Remote Mode Change: DISABLED
Mode attention Char: \0x1b
System mode char: S
User mode char: U
Baud rate: 19200 (suggested)
Stop bits: 1
Parity: None
Station address: 5 (this devices ID#)
Control line: No Handshaking
Reply Msg Wait (20ms):
ACK timeout (20ms):
DF1 retries: 3
Msg appl timeout(30 secs):2
Error detect: BCC / CRC
RTS send delay (20ms): 0
RTS off delay (20ms): 0
Polling mode: Message Based (Do Not Allow Slave to initiate messages)
Master Message Transmit: Between Station Polls

System (Point-To-Point) additional setup:
Duplicate Detect: OFF
NAK Receive: 0
DF1 ENQS: 0

(Refer to the *Allen-Bradley Programming Overview* Section for more information)

READ MESSAGE SETUP EXAMPLE

Instruction Entry for Message Block MG14:0:
Communication Command: SLC Typed Logical Read
PLC-5 Data Table Address: N9:3
Size in Elements: 20
Local/Remote: Local
Local Node Address: 004 (Quantum™ Panel's ID)
Destination Data Table Address: N10:1
Port Number: 0

(Refer to the *Allen-Bradley Programming Overview* Section for more information)

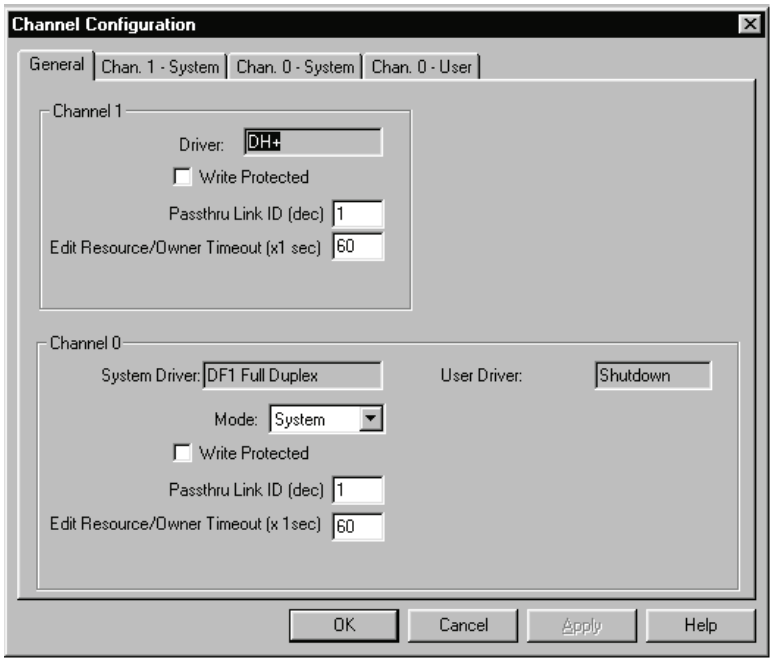
Allen-Bradley Programming Overview

This section contains programming examples for reading data from, and writing data to the Frick Quantum™ control panel from an Allen Bradley (AB) SLC500 or PLC5 processor. AB RSLogix500 programming software has been used for the following examples, however, these examples can also be used for the AB RSLogix5 software.

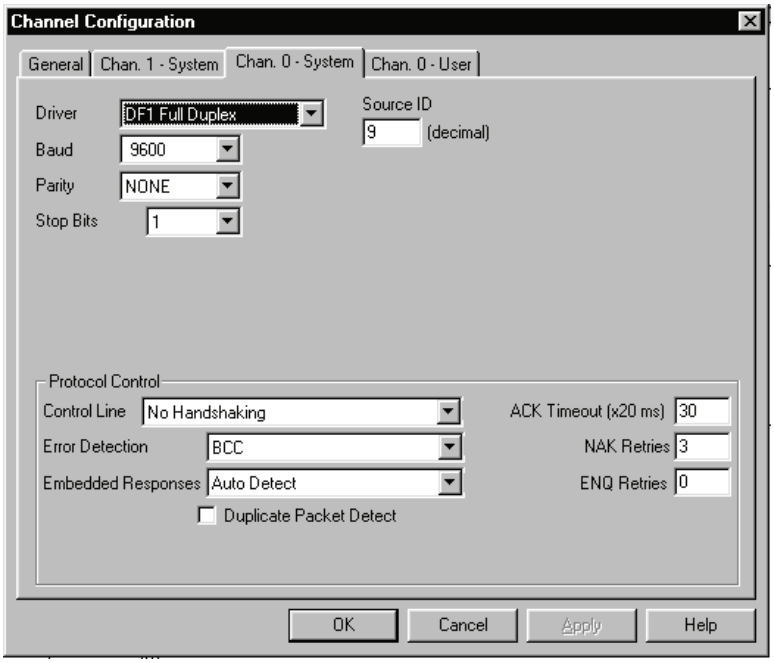
CHANNEL CONFIGURATION

The following are representations of the channel configuration screens from the AB RSLogix500 programming software for the SLC500. Enter values as shown in order to establish communications via AB Protocol.

General Configuration

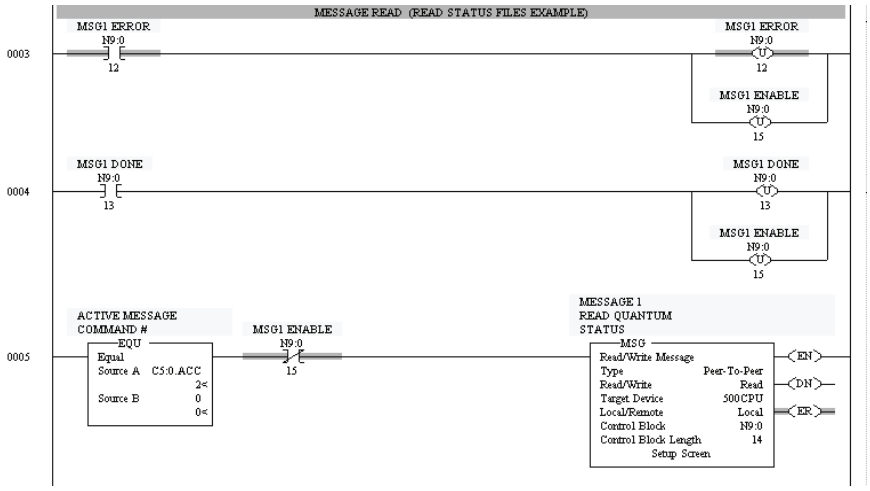


System Configuration



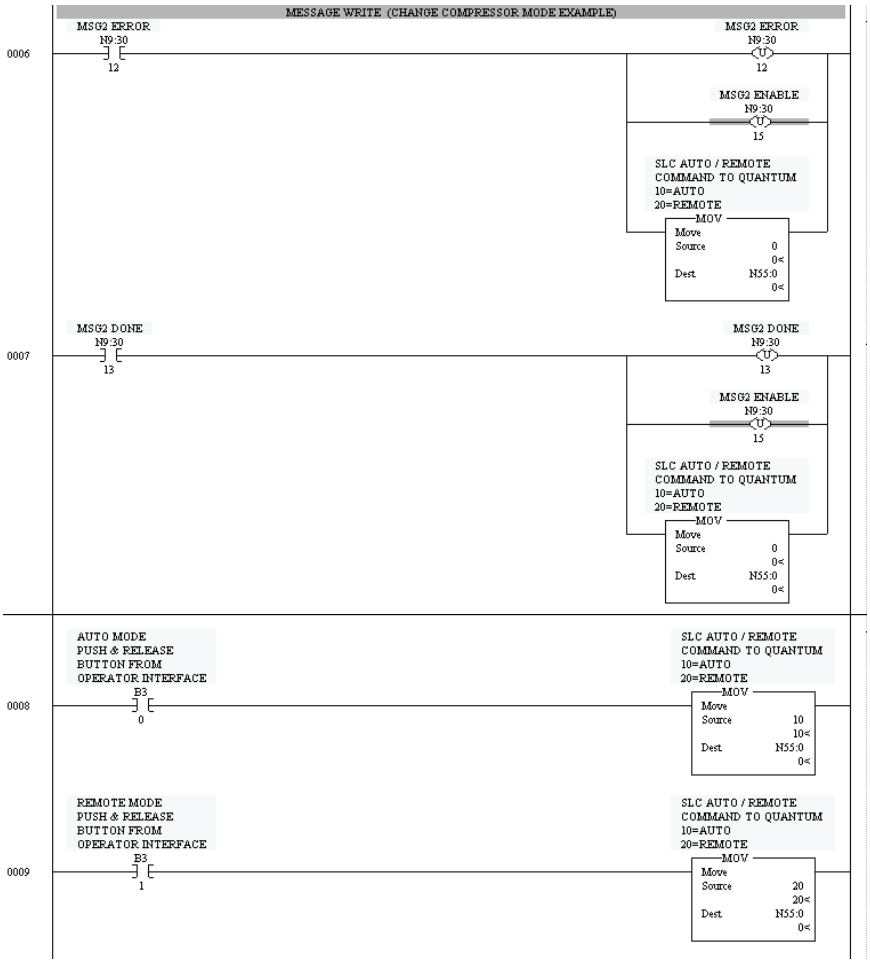
MESSAGE READ LOGIC

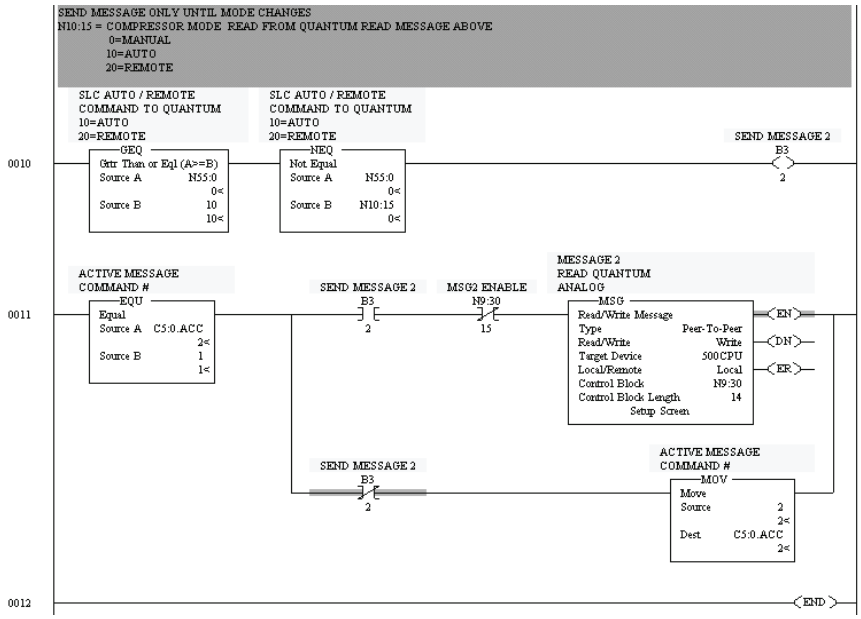
Use the following logic as an example, to read data from the Quantum™ panel. To read more data or to read data from several Condenser/Vessels, copy / paste these rungs as needed then modify the control block and setup screen parameters accordingly.



MESSAGE WRITE LOGIC

Use the following logic as an example, to write data from the Quantum™ panel. To write more data or to write data to several Condenser/Vessels, copy / paste these rungs as needed then modify the control block and setup screen parameters accordingly.




SEND MESSAGE ONLY UNTIL MODE CHANGES
N10:15 = COMPRESSOR MODE READ FROM QUANTUM READ MESSAGE ABOVE
0=MANUAL
10=AUTO
20=REMOTE
SLC AUTO / REMOTE COMMAND TO QUANTUM 10=AUTO 20=REMOTE
GEQ
Grtr Than or Eql (A>=B)
Source A N55:0 0<
Source B 10 10<
SLC AUTO / REMOTE COMMAND TO QUANTUM 10=AUTO 20=REMOTE
NEQ
Not Equal
Source A N55:0 0<
Source B N10:15 0<
SEND MESSAGE 2
B3 2
0010
ACTIVE MESSAGE COMMAND #
EQU
Equal
Source A C5:0.ACC 2<
Source B 1 1<
SEND MESSAGE 2
B3 2
MSG2 ENABLE
N9:30 15
MESSAGE 2 READ QUANTUM ANALOG
MSG
Read/Write Message
Type Peer-To-Peer
Read/Write Write
Target Device 500CPU
Local/Remote Local
Control Block N9:30
Control Block Length 14
Setup Screen
EN
DN
ER
0011
SEND MESSAGE 2
B3 2
ACTIVE MESSAGE COMMAND #
MOV
Move
Source 2 2<
Dest C5:0.ACC 2<
END
0012

MODBUS® Protocol

Description

Since MODBUS® protocol is a messaging structure, it is independent of the underlying physical layer. It is traditionally implemented using RS-232, RS-422, or RS-485 communications hardware.

The Quantum™ controller is setup to communicate on standard MODBUS® networks using ASCII (American Standard Code for Information Interchange).

> **NOTE:** With the Quantum™ Controller, **ONLY** Modbus ASCII (7 data bits) is recognized, and all references to MODBUS® protocol in this document will be as they relate to ASCII. The mode and serial parameters must be the same for all devices on a MODBUS® network, therefore, ensure that your network is utilizing the MODBUS® ASCII protocol before attempting to try to communicate to the Quantum™ portion of the network. Additionally, typical MODBUS® protocols allow for network broadcasting, whereby a single message can be sent to all devices simultaneously. Broadcasting is NOT allowed or supported by the Quantum™ software.

The Quantum™ provides the capability to interface with other devices that support serial data communications using the MODBUS® ASCII protocol. This is a Master / Slave multi-drop communication method whereby the Quantum™ is setup to be a MODBUS® ASCII Slave. The customer's PLC (Programmable Logic Controller) or DCS (Data Communications System, such as a personal computer) must be setup as a MODBUS® ASCII Master. The Master initiates the reading and writing of data (queries) to a Quantum™. The Quantum™ does not generate its own data, it will only reply from a request by the Master.

The Quantum™ ID number is used as the MODBUS® Slave address. The Master uses Function Code 3 (Read Holding Registers) to send a request to read data from the Quantum™. The Master uses Function Code 6 (Load Register) to request to change a setpoint or to send a command. Up to fifty (50) data elements can be read with one read request.

Address references are numbered relative to the Frick addresses in the Quantum™ Data Table (see *MODBUS® Addressing Note* in the "Quantum™ Data Table" section of this manual for additional information). The Quantum™ only accepts one value with a Load Register request. Changing a setpoint causes the Quantum™ to save the new setpoint to nonvolatile memory. Be careful not to continuously request a setpoint change. Keeping the Quantum™ busy writing to memory will interfere with the Quantum™ communicating to its I/O boards. A communication failure to an I/O board will cause a shutdown. For more detail and a list of the data, reference the *Quantum™ Data Table* section of this manual. For details and information about the actual protocol, reference the Modicon website at http://www.modicon.com.

The read (query) and write examples on the following pages are executed using a terminal emulation package known as Hyperterminal (for more information, refer to the Hyperterminal section in this manual). When using Hyperterminal, use the Frick addresses listed in the address tables, rather than the Modbus addresses. This is because Hyperterminal does not use a Modbus driver as a protocol, but rather a pure ASCII data packet. The Quantum™ however, does need to be set to MODBUS® protocol to properly interpret the ASCII data.

Port Configuration of The Master

7 Bits per Character (Data Bits)
No Parity
1 Stop Bit
No Handshake

Data Packet

The MODBUS® protocol establishes the format for the Master's query by creating a message (data packet) as follows:

- Assign the device address (Quantum™ panel ID #). The address field of a message frame contains two characters (ASCII). Valid Quantum™ device addresses are in the range of 01 – 99 decimal. A master addresses a Quantum™ by placing the address in the address field of the message. When the Quantum™ sends its response, it places its own address in this address field of the response to let the Master know which Quantum™ is responding.
- A function code defining the requested action (Query):
- Function Code 3 - to read holding registers (sends a request to read data from the Quantum™).

  - OR -

- Function Code 6 to load a register (to request to change a setpoint or to send a command such as starting the compressor).
- Any data to be sent (Response). The data field is constructed using sets of two digits, in the range of 00 to FF hexadecimal. These

are made from a pair of ASCII characters. The data field of sent from a Master to the Quantum™ devices contains additional information which the Quantum™ must use to take the action defined by the function code. This can include items like discrete and register addresses, the quantity of items to be handled, and the count of actual data bytes in the field. If no error occurs, the data field of a response from a Quantum™ to a Master contains the data requested. If an error occurs, the field contains an exception code that the Master application can use to determine the next action to be taken.

- An error-checking field.

The Query

The function code in the query tells the addressed Quantum™ what kind of action to perform. The data bytes contain any additional information that the Quantum™ will need to perform the function. For example, function code 03 will query the Quantum™ to read holding registers and respond with their contents. The data field must contain the information telling the Quantum™ which register to start at and how many registers to read. The error check field provides a method for the Quantum™ to validate the integrity of the message contents.

The Response

If the Quantum™ makes a normal response, the function code in the response is an echo of the function code in the query. The data bytes contain the data collected by the Quantum™, such as register values or status. If an error occurs, the function code is modified to indicate that the response is an error response, and the data bytes contain a code that describes the error. The error check field allows the master to confirm that the message contents are valid.

Data Field

The data field is constructed using sets of two hexadecimal digits, in the range of 00 to FF hexadecimal. These can be made from a pair of ASCII characters.

The data field of messages sent from a master to the Quantum™ devices contains additional information which the Quantum™ must use to take the action defined by the function code. This can include items like discrete and register addresses, the quantity of items to be handled, and the count of actual data bytes in the field.

For example, if the master requests a Quantum™ to read a group of holding registers (function code 03), the data field specifies the starting register and how many registers are to be read.

If no error occurs, the data field of a response from a Quantum™ to a Master contains the data requested. If an error occurs, the field contains an exception code that the Master application can use to determine the next action to be taken.

Error Checking

When data is transmitted to and from the Quantum™ Controller, each message has an Error Checking value appended to the end of the message. Because the Quantum™ utilizes MODBUS® ASCII protocol, Longitudinal Redundancy Check, or LRC, is used as the method for verifying that the message sent from the transmitting device, was properly received by the receiving device.

The Longitudinal Redundancy Check (LRC) field is one byte, containing an eight-bit binary value. The LRC value is calculated by the transmitting device, by adding together successive eight-bit bytes of the message, discarding any carries, and then two's complementing the result. It is performed on the ASCII message field contents excluding the colon character that begins the message, and excluding the CRLF pair at the end of the message. The LRC is appended to the message as the last field preceding the CRLF (Carriage Return - Line Feed) characters. Each new addition of a character that would result in a value higher than 255 decimal simply rolls over the field's value through zero. Because there is no ninth bit, the carry is discarded automatically.

The receiving device recalculates an LRC during receipt of the message, and compares the calculated value to the actual value it received in the LRC field. If the two values are not equal, an error results.

ASCII Framing

In ASCII mode, messages start with a colon (:) character (3A hex), and end with a carriage return-line feed (CRLF) pair (0D and 0A hex).

The allowable characters transmitted for all other fields are hexadecimal 0 - 9, A - F.

All Quantum™ panels connected to the network monitor the network bus continuously for the colon character. When one is received, each Quantum™ decodes the next field (the address field) to find out if it is the addressed device.

A MODBUS® message is placed by the transmitting device into a frame that has a known beginning and ending point. This allows receiving devices to begin at the start of the message, read the address portion and determine which device is addressed, and to know when the message is completed. Partial messages can be detected and errors can be set as a result.

A typical message frame as sent by the Master is shown below.

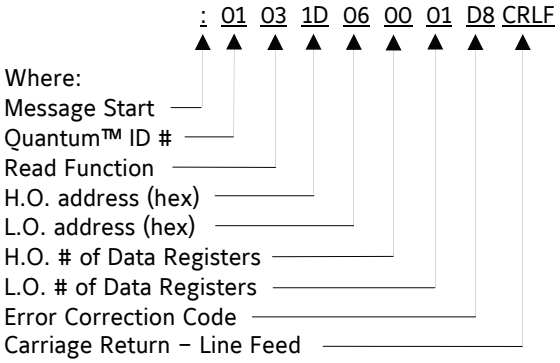
START	ADDRESS	FUNCTION	DATA	LRC CHECK	END
:	01	03	1D060001	D8	CRLF
1 CHAR	2 CHAR	2 CHAR	8 CHAR	2 CHAR	2 CHAR

Where
: = Start of Message
01 = Quantum™ ID
03 = Read Function
1D = H.O. address (hex)
06 = L.O. address (hex)
00 = H.O. # of Data Registers
01 = L.O. # of Data Registers
D8 = Error Correction Code
CRLF = Carriage Return – Line Feed

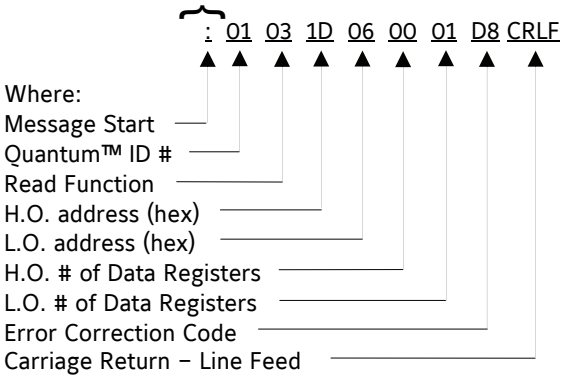
Query (Read) Example:

To demonstrate how an address within the Quantum™ LX may be read, the following test can be performed using Windows HyperTerminal:

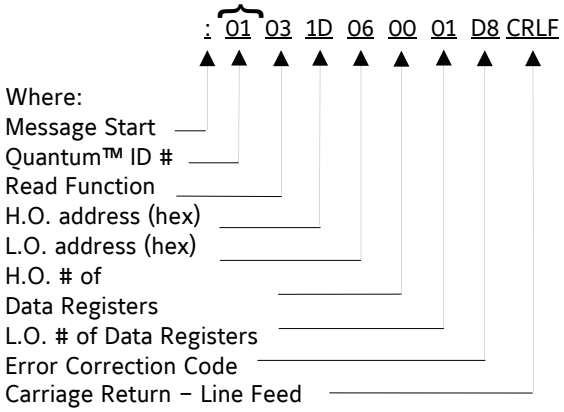
As an example, a MODBUS® command will be created, and sent to obtain the Control Setpoint for the Condenser. Using the address tables found later in this manual, locate the address for *Summer Mode Temperature*. In this case, it would be Frick Address 7430 (decimal). Since this is the only address we are interested in obtaining the value of, send the following message:



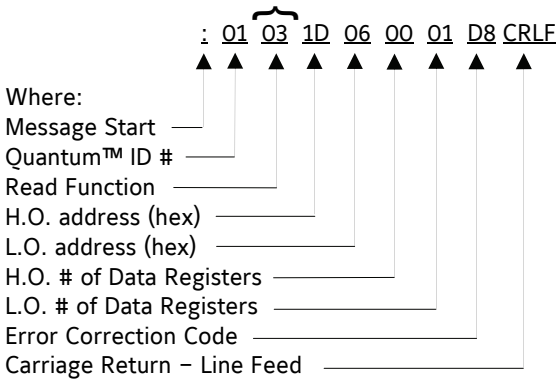
The first part of the message will be a Colon (:). This represents a "heads up" alert that data is coming "down the line".



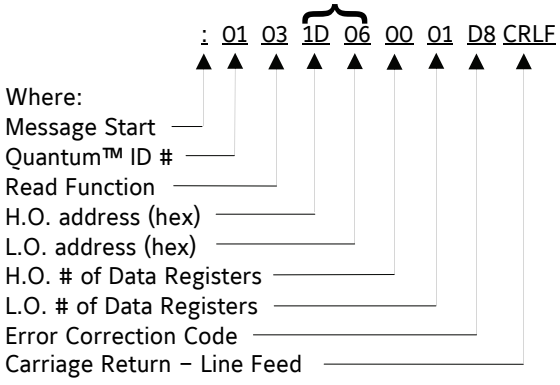
Any time that a message is sent, all of the Quantum™ LX panels that are on the MODBUS® network will become active, communications wise, once the Colon appears. Next, all panels will look at the first byte following the Colon (:). If this byte equals the Panel ID # of the particular Quantum™ being queried, it will immediately finish reading the remainder of the message. If the byte does not equal its ID #, the message will be ignored.



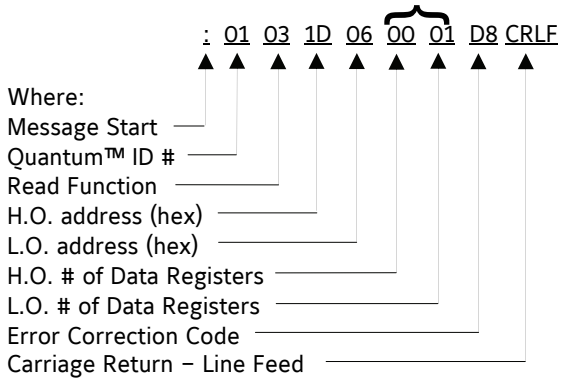
In this particular example, we are strictly looking to request to view a data value, so we will be performing a read function (03):



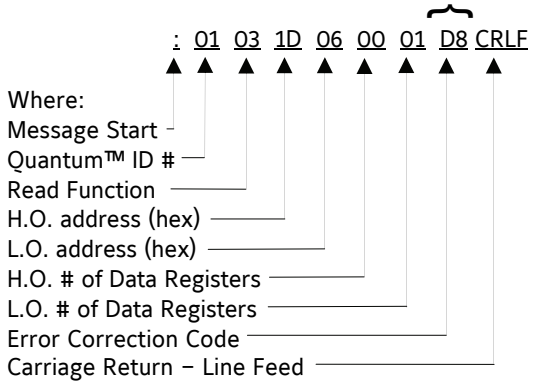
Address 7430 decimal equals 1D06 hex. Looking at our example, we see that we need a H.O. (High Order) address and a L.O. (Low Order) address. Since all data sent and received is in ASCII Hex Byte format, we need to look at 06 Hex as the Low Order portion of the address. The High Order portion is 1D. Now our decimal 7400 is formatted as 1D06 Hex.



Since we are only looking for this one address, and no other, we can say that we are only looking for one Data Address. Our Data Address part of the data packet is also looking for a High and a Low Order value. Fortunately, the number one (1) is the same in decimal as it is in Hex, therefore, the Low Order Address is 01 (hex). The High Order Address is 00 (hex), so our decimal 1 is formatted as 0001 (hex).



In order to ensure that the Quantum™ in question receives the data request accurately, we must append an Error Check byte to the end of the message. This is accomplished by adding each of the byte pairs (hex) that we have generated thus far:

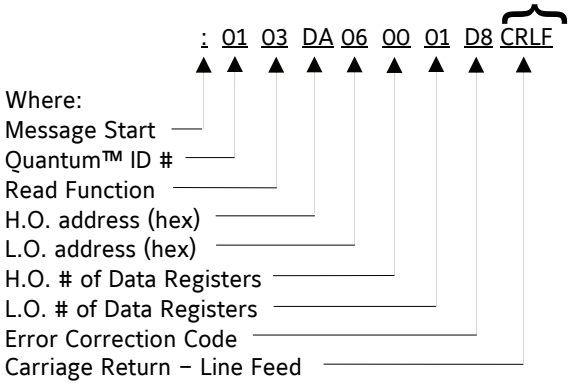


01 + 03 + 1D + 06 + 00 + 01 = 28 hex

Next, subtract 28 (hex) from 100 (hex):

100 (hex) - 28 (hex) = D8 (hex)

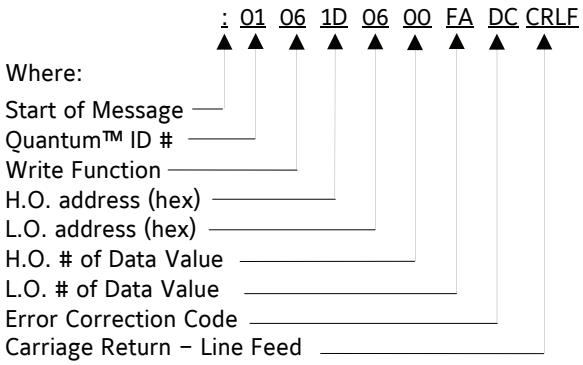
After the entire data packet has been created, simply press the **[Enter]** key, a Line Feed will automatically be sent also.



Write Example

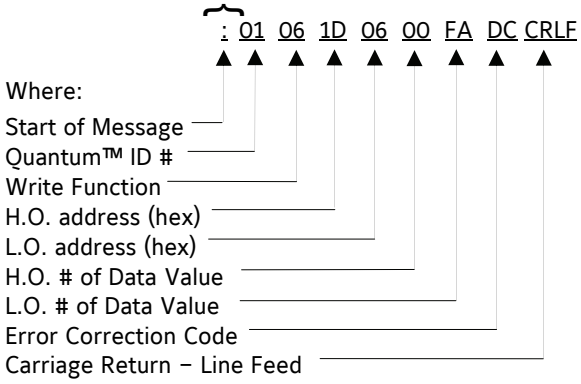
To demonstrate how an address within the Quantum™ may be written to, the following test can be performed using Windows HyperTerminal:

As an example, a MODBUS® command will be created, and sent to set the Quantum™ to set the *Sumer Mode Temperature* to 25.0° C. First, be aware that data sent to and received by the Quantum™ LX has one decimal place assumed. This means that to send the value of 25.0, you actually need to send 250. Using the address tables found later in this manual, locate the address for the *"Summer Mode Temperature.* In this case, it would be Frick Address 7430 (decimal). Since this is the only address we are interested in writing to, send the following message:



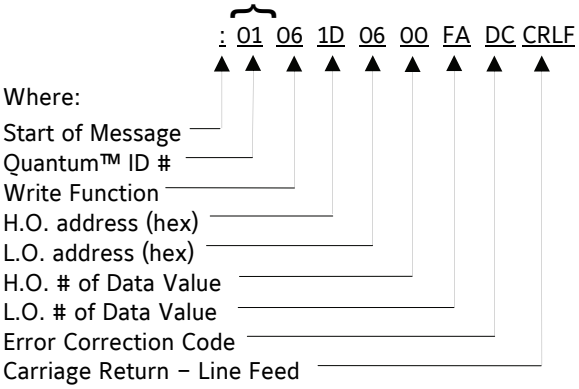
Look at this message on a more basic level, to understand how the address that we are writing to is arrived at. We want to send the value of 250 (25.0) to *Sumer Mode Temperature* setpoint, Frick Address 7430 (decimal).

The first part of the message will be a Colon (:). This represents a "heads up" alert that data is coming "down the line".

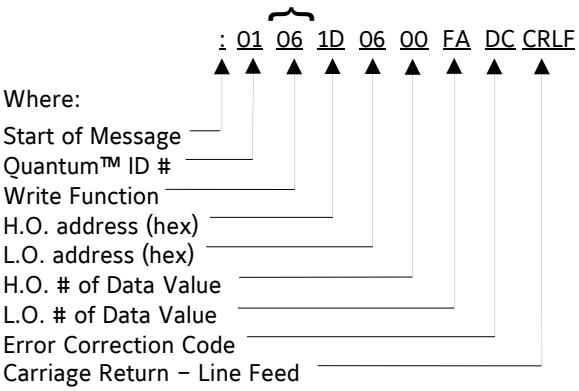


Any time that a message is sent, all of the Quantum™ panels that are on the Modbus network will become active, communications wise, once the Colon appears. Next, all panels will look at the first byte following the Colon (:). If this byte equals the Panel ID # of the particular Quantum™ being queried, it will immediately finish reading the remainder of the

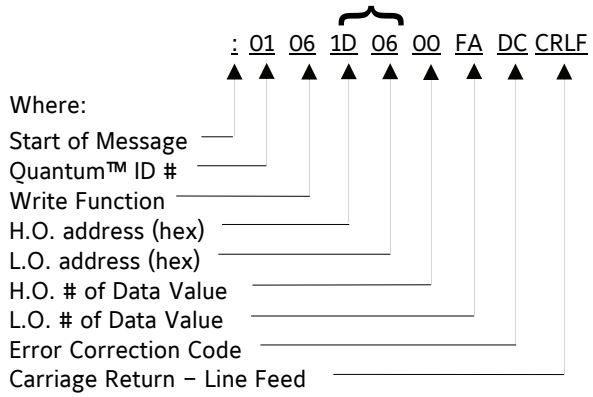
message. If the byte does not equal its ID #, the message will be ignored.



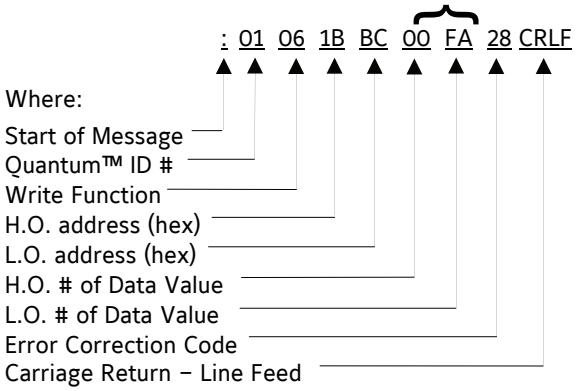
n this particular example, we are strictly looking to write a data value, so we will be performing a write function (06):



7340 decimal equals 1D06 hex. Looking at our example, we see that we need a H.O. (High Order) address and a L.O. (Low Order) address. Since all data sent and received is in ASCII Hex Byte format, we need to look at 06 Hex as the Low Order portion of the address. The High Order portion is 1D. Now our decimal 7340 is formatted as 1D06 Hex:



The value that we wish to send is 25.0 (250). Our Data Value part of the data packet is looking for a High and a Low Order value. The number 250 (dec) must be converted to hexadecimal. This conversion results in 00FA (hex). Separating 00FA into two bytes results in the Low Order Value of FA (hex) and the High Order Value of 00 (hex):

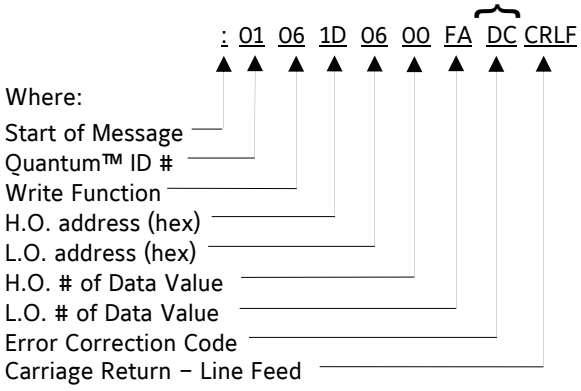


In order to ensure that the Quantum™ in question receives the data request accurately, we must append an Error Check byte to the end of the message. This is accomplished by adding each of the byte pairs (hex) that we have generated thus far:

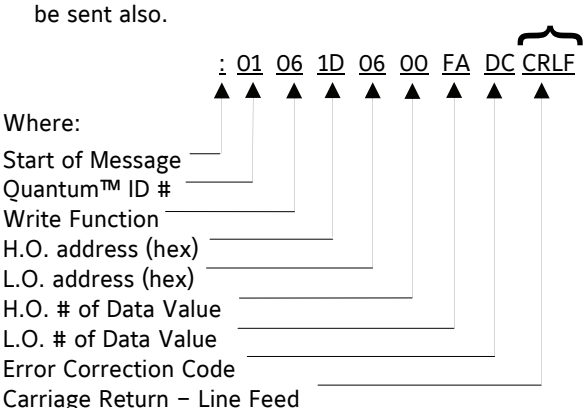
01 + 06 + 1D + 06 + 00 + FA = 124 hex

Normally, we would subtract 124 (hex) from 100 (hex), as in the previous read example. However, in this case we see that 124 hex is greater than 100 hex. Since the math in this particular example would yield a negative number (FFFFFFDC), we need to modify the value of 124 Hex in order to provide a positive result. This is accomplished quite simply by dropping the most left hand digit (124 becomes 24):

100 (hex) – 24 (hex) = DC (hex)



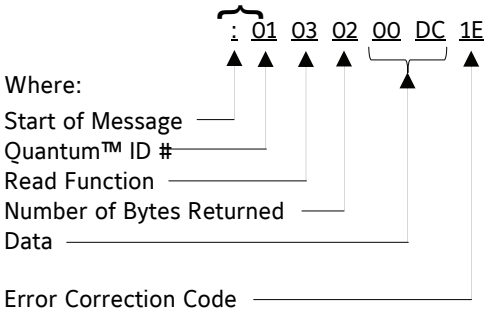
After the entire data packet has been created, simply press the [Enter] key, a Line Feed will automatically be sent also.



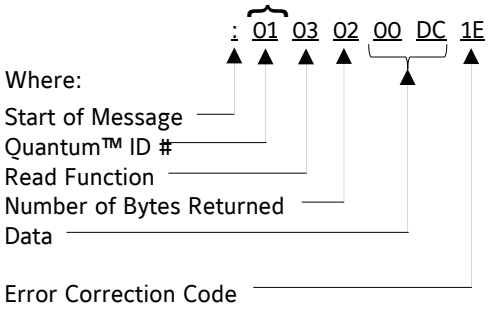
Response Example

Using the Query (Read) Message example used earlier, if the packet was properly received by the Quantum™, you should see an immediate response in HyperTerminal. In the Query Response (read function) example used earlier, a response of **:01030200DC1E** (hex) was received.

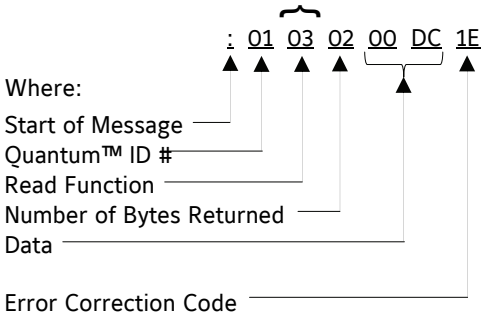
Once again, the first part of the message will be a Colon (:). This represents a "heads up" alert that data is coming "down the line", but since the data is coming from the Quantum™ to the Master this time, the Master will accept it.



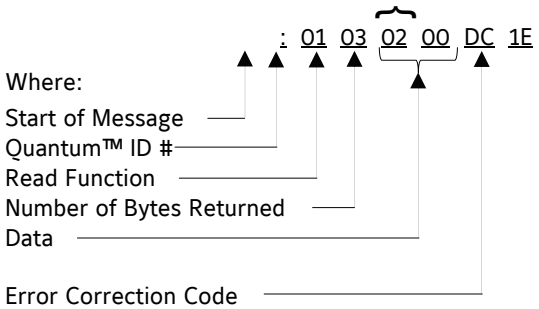
After having received the Colon (:), the Master will look at the two bytes that follows it, so that it may determine from which Quantum™ the message is coming from.



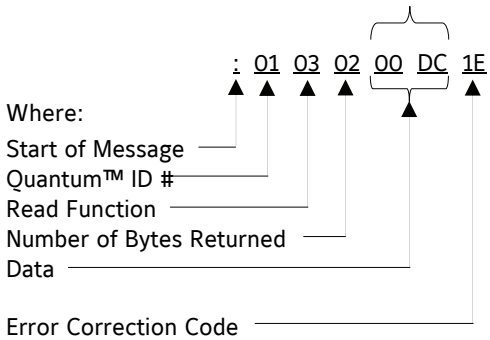
Now that the Master knows which panel is responding, it needs to known which function the panel is responding to. In this case, it sees that it is a read function, and the Quantum™ is merely returning a value that was previously requested.



The next byte tells the Master how many bytes of information are being returned as a response. In this case, there are two (2) bytes of valid data.



The next two bytes (in this case) are the actual data in response to our original request.



We need to know what this value means. To break it down, we must convert the pair of bytes from Hex to Decimal:

00DC (hex) = 220 (decimal)

Data sent to and from the Quantum™ consist of numbers having one decimal place. Therefore:

220 (decimal) = 22.0 (decimal)

All temperatures are in degrees C and all pressures are in PSIA unless the command is sent to select the units of the panel. Therefore:

22.0 (decimal) = 22.0 C

Therefore, the value of the *Summer Mode Temperature* is 22.0° C.

ASCII NOTES

This has been an example of how the Quantum™ Controller uses the MODBUS® Protocol. It is hoped that the information provided here will assist the end user in writing applications that will allow the Quantum™ to be implemented into networks that the customer may already have in use.

This information is subject to change at any time, and is provided as a reference only. Not all areas of the MODBUS® Protocol can be handled in this document. Some additional information regarding MODBUS® Protocol that the end user should be aware of:

- There are many versions of MODBUS® Protocol that is available, and an application that works properly on one system, may not function identically on another.
- Some versions of MODBUS® Protocol may require the user to increment any referenced addresses by "1" (one). For instance, if you wanted to look at Frick Address 135, you may need to actually look at address 136. The Quantum™ addressing begins at 0 (zero), whereas some MODBUS® Protocols begin at 1 (one), therefore, you may need to compensate.
- Follow the Frick specifications for data communications requirements.

RTU Query (Read) Example

(**NOTE**: Hyperterminal cannot be used to test RTU):

In the following example, a MODBUS® command is sent to obtain the actual Room Pressure. Refer to the following example to see what this message packet would look like:

Start	Address	Function	Starting Address		# of Registers to Load		CRC		End
T1-T2-T3-T4	01	03	07	D7	00	01	*	*	T1-T2-T3-T4

Start of message
Panel ID
Function 03 = Read
07 = H.O. Address
D7 = L.O. Address
00 = H.O. # of Data of Registers
01 = L.O. # of Data Registers
Error Correction Code
End of message

* The CRC value is calculated by the transmitting device, which appends the CRC to the message.

RTU Response Example

Using the RTU Read example just shown, a typical response would look like:

Start	Address	Function	Byte count to follow	Answer		CRC		End
T1-T2-T3-T4	01	03	02	04	23	*	*	T1-T2-T3-T4

Start of message
Panel ID
Function 03 = Read
02 = 2 bytes
04 = H.O. value
23 = L.O. value
Error Correction Code
End of message

The returned value in the above example is 0423 hex. Converting this to decimal equates to 1059, and assuming a decimal point gives an answer of 105.9 (PSIA or Panel units, depending on which has been selected).

MODBUS® NOTES

- 7 Data bits are used for ASCII
- 8 Data bits are used for RTU.
- 1 or 2 Stop bits may be used.
- Parity can be set to *None*, *Odd* or *Even*
- Follow the Frick® specifications for data communications requirements.
- Hyperterminal can be used to test ASCII, but not RTU or TCP/IP communications.
- When using MODBUS® TCP, use port 502.
- When using Modicon Setup Software, ensure that:
  - Head Number = Rack Position (position of Ethernet card in its rack)
  - Map Index = Quantum physical ID number
  - Socket # = 502

NOTE: Be careful not to continuously request a setpoint change. It is to be expected that communications may slow down during the process of writing setpoints or clearing alarms. Both of these processes involve writing to either EEPROM or Flash Memory and does take some time. If communication requests are being sent faster than once every couple of seconds, there will be temporary slowdowns during these processes.

MODBUS® Data Access

Data sent to and from the Quantum™ consist of numbers having one decimal place. For example, if a data value of 25.5 must be transmitted as a 255.

By default, all temperature and pressure values are transmitted as degrees C, and PSIA, respectively.

However, the Quantum™ can be configured to return all temperature and pressure data in the prescribed Panel Units. This change can be made by setting address 49021 to 1 (Panel Units). The Panel Units can be accessed and altered in the human interface (HMI) by selecting MENU > SETPOINTS > PANEL.

A mode such as Defrost mode is sent as an integer value that represents the mode it is in. For example, a 0 is sent if it is in manual, or a 10 is sent if it is in automatic, or a 20 is sent if it is in remote. The value zero (0) is used to represent an *OFF* status and a *DISABLED* option. The value one (1), which is received as a 10, is used to represent an *ON* status and an *ENABLED* option. Only data values that are designated as setpoints are modifiable. *Read Only* is used to help identify what data is not modifiable. The setpoint range is checked to see if it is an allowed setting. If it is not allowed, the setting is not changed. Reference the *Quantum™ Data Tables* in this manual for the address listing and description of data.

HYPERTERMINAL

Description

HyperTerminal is a terminal emulation program which resides in the Microsoft Windows environment, and as such, will normally be found on any computer that is running Microsoft Windows. HyperTerminal provides a method by which the end user may verify conclusively that their Quantum™ controller is functioning properly, and as designed, with respect to external communications to remote devices.

> **NOTE**: Hyperterminal can only be used to test the Frick® Protocol or MODBUS® ASCII. It CANNOT be used to test Allen-Bradley or MODBUS® RTU or TCP/IP.

Many times, the Quantum™ controller will be installed into an environment whereby the end user wishes to communicate to it, either through a PLC (Programmable Logic Controller), a desktop computer for the purpose of monitoring/controlling plant operations through HMI (Human Machine Interface), or any number of other communications applications.

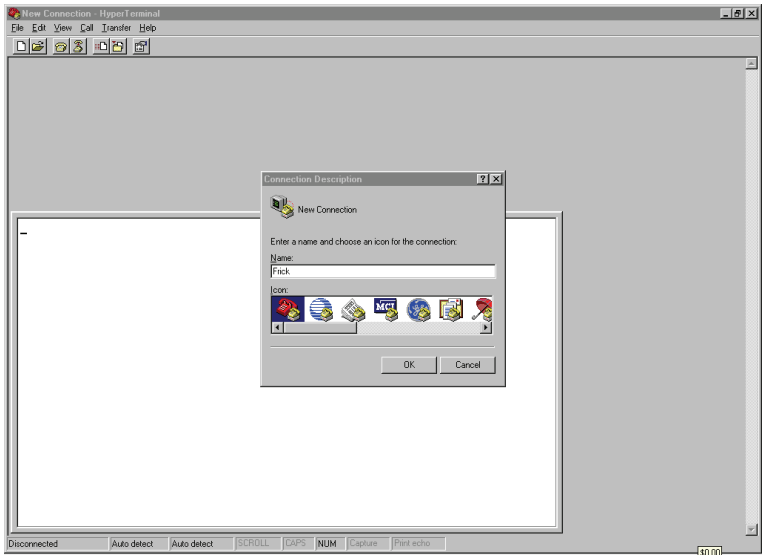
The purpose of this desired communications typically involves viewing and changing setpoints, starting and stopping a compressor, viewing alarm and shutdown information, and viewing current operating conditions.

When first connecting a Quantum™ panel to a communications network, it would be highly desirable to determine that all necessary parameters (jumper settings, panel setup, and cabling) are properly met so that communications may be established quickly with the Quantum™, so that time is not lost in trying to troubleshoot a potentially simple problem.

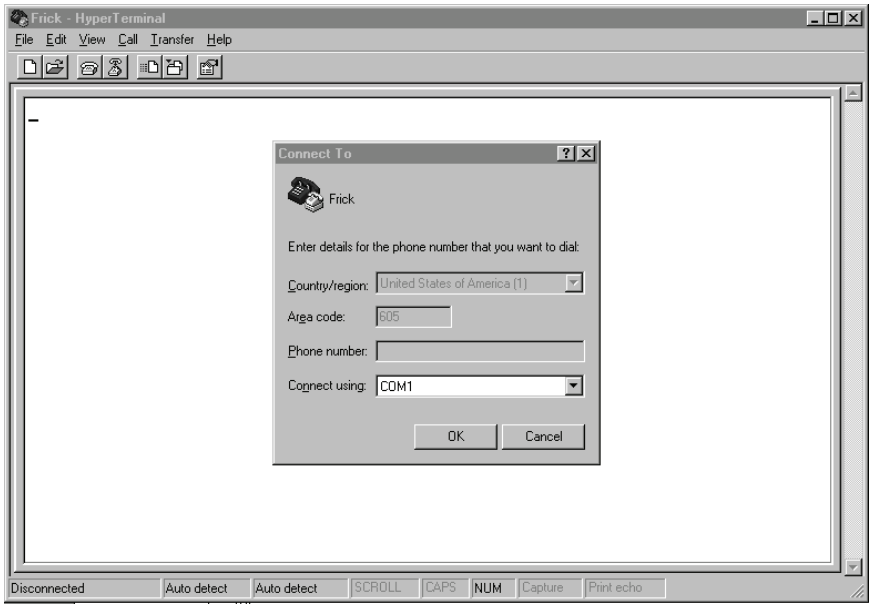
A modem or direct connection from a Comm port of a computer running Microsoft Windows can be used to connect to Com-2 of the Quantum™.

Setting up Hyperterminal

- You will need to locate either a lap top or desktop computer that has Hyperterminal installed.
- Turn on the power for the computer.
- After the computer has fully booted, locate the Hyperterminal program. (Hyperterminal is usually found in the *Accessories* folder). If Hyperterminal can't be found there, try using the *Find File* command, and search the entire hard drive.
- Be aware that the screens that are actually shown on the test computer may or may not appear exactly as shown here. Various versions of Windows can affect the appearance, as well as whether or not the screen has been maximized, or if it has been scaled to a smaller size. Regardless of how the screen work appears, the function of the screen work is what is important, and that function is not affected by the way the screen looks.
- Once Hyperterminal has been located, execute it. A dialog box will appear. You will be prompted to enter a name for the *New Connection*. Type in whatever name you would like to use, *Frick®* was used in this example. This name will also create a file once you are finished, saving all of the setup parameters for future use. It is recommended that a name be chosen to reflect the type of Protocol that you will be using as you may wish to setup for various protocols. Once you have entered a name, click **[OK]**.



A new dialog box will be shown asking to select a Com port (choose the Com port that your communications cable is attached to, this will normally be Com-1). The phone number box should be blank. Click on **[OK]**.



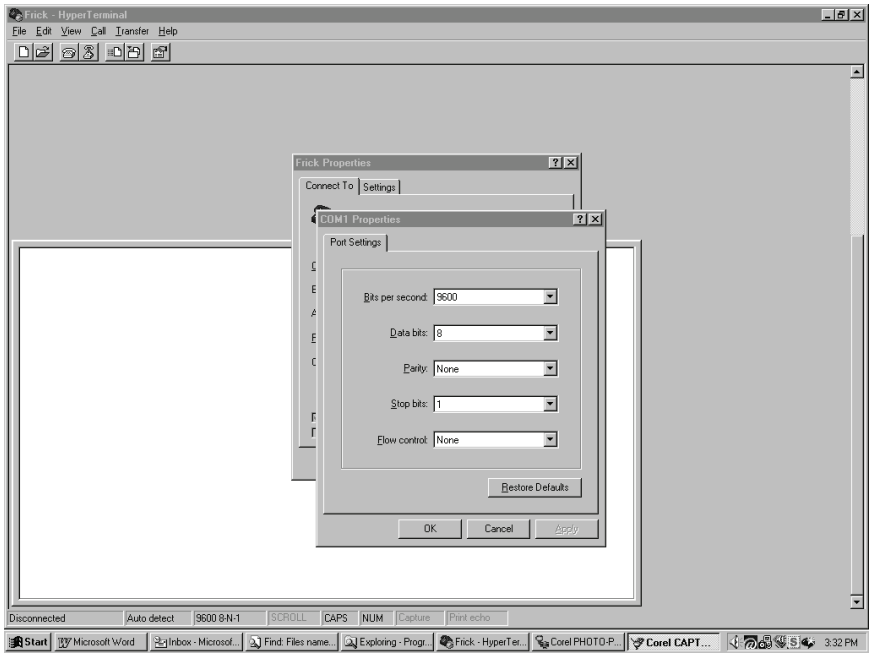
The Com-1 properties dialog box will now appear. The parameters in this box must match the requirements of the protocol that you are wishing to use. The one box that normally would need to be changed from one protocol to the next is the *Data Bits* box. For MODBUS® ASCII, you can use either 7 or 8 data bits, for Frick® and Quantum™ protocols, use only 8 data bits.

NOTE: Allen-Bradley, MODBUS® RTU and TCP/IP protocols cannot be tested using Hyperterminal.

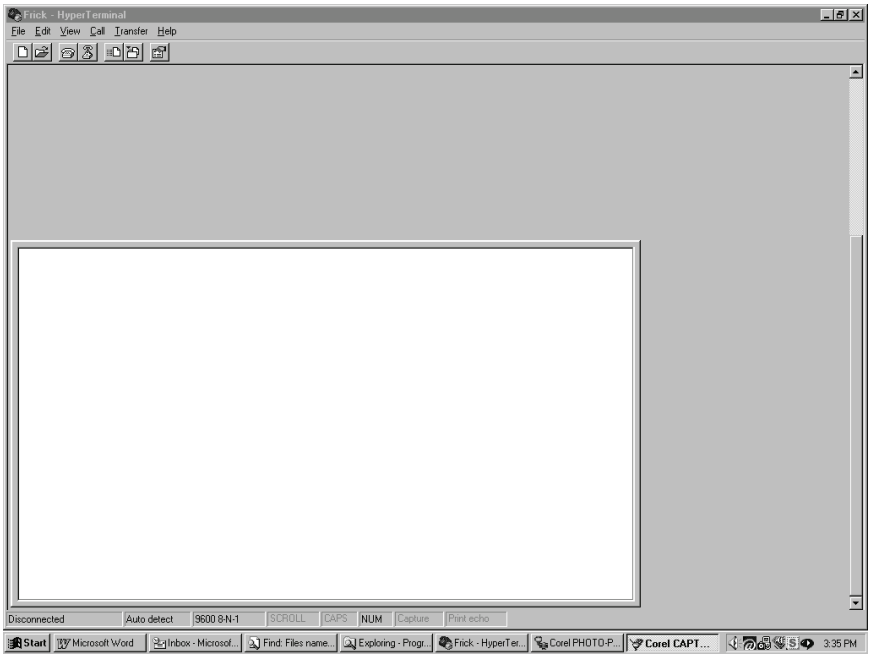
For the purpose of this document, Frick® # protocol will be used. Refer to the MODBUS® ASCII section of this manual for information on MODBUS®.

Set the five boxes as follows then click **[OK]**.

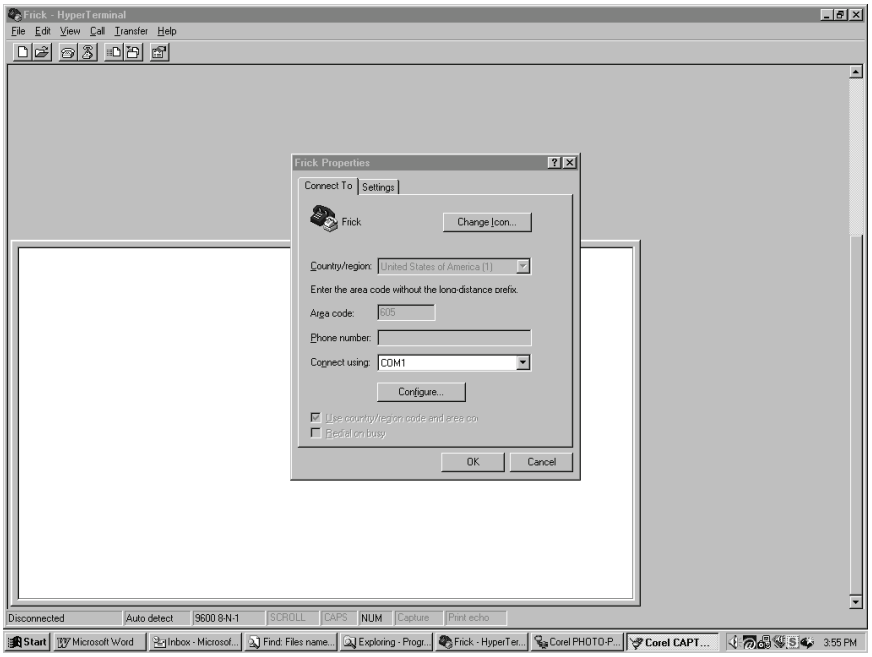
- Bits per second: 9600 (must match the Quantum™)
- Data bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None



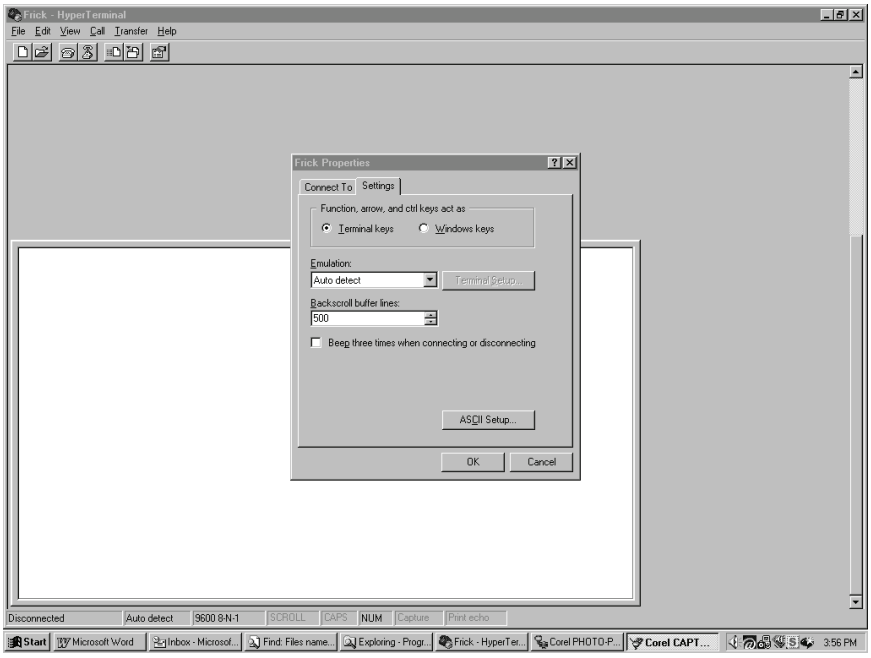
The following screen will appear. This is the screen whereby all communications (out of the computer and into it) will be shown. When valid data is typed in here then sent, the connected device recognizes and responds to that data, and a response will be shown below the sent data. Click on **[File]**.



A pull down menu will appear. From this menu, locate and click on **[Properties]**. You will once again see the following screen. This time, click on the **[Settings]** tab.



The computer will need to be set up to match the documentation as presented here, for everything to look and work as shown later. To do this, click on the **[ASCII Setup...]** button.



On the *ASCII Setup* screen, for best results, check the boxes according to the following chart:

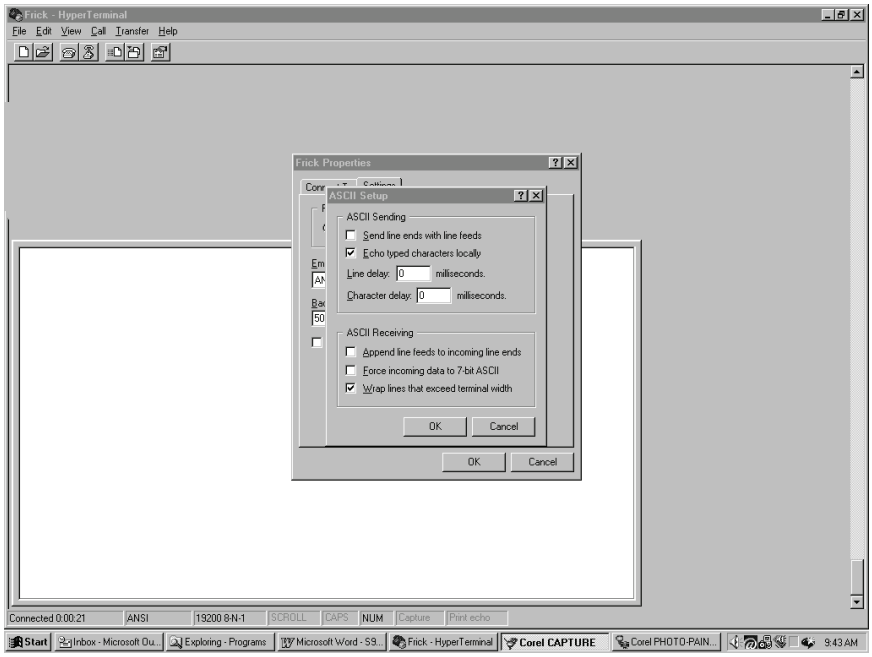
For MODBUS® ASCII:

- Send line ends with line feeds
- Echo typed characters locally
- Append line feeds to incoming line ends
- Wrap lines that exceed terminal width

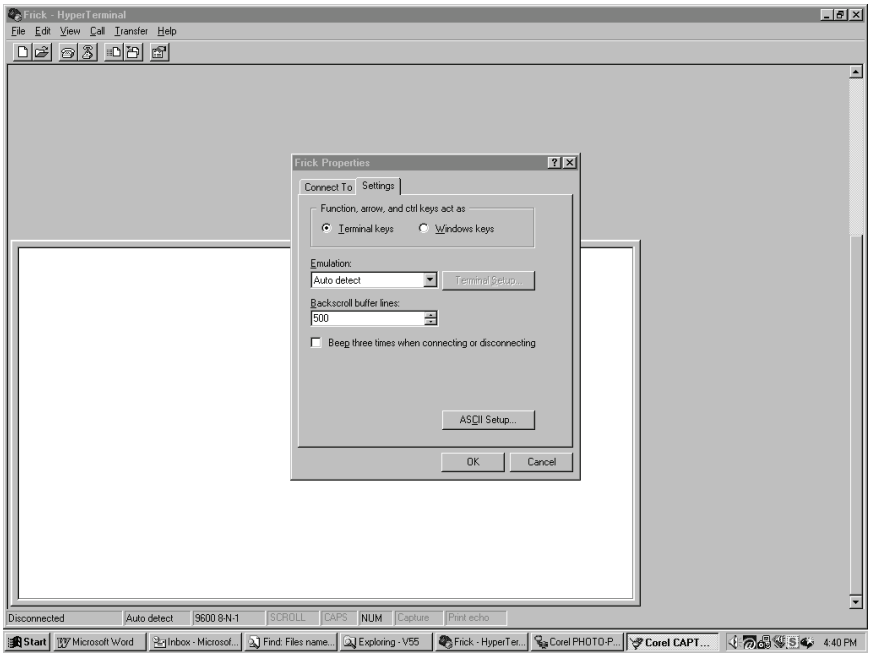
For Frick® protocols ($):

- Echo typed characters locally
- Append line feeds to incoming line ends
- Wrap lines that exceed terminal width

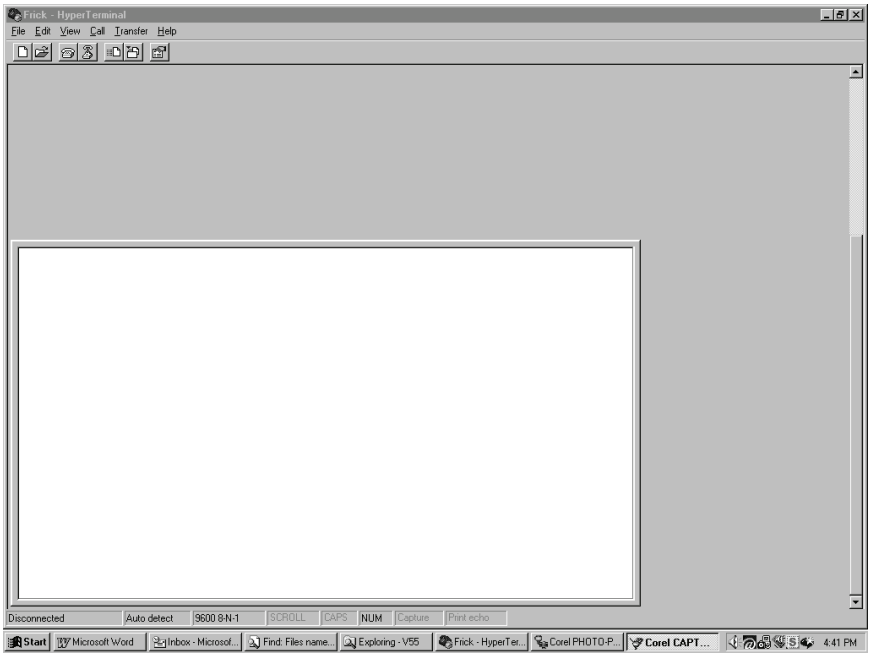
Leave everything else on this dialog box unchanged then click on **[OK]**.



The *Properties* screen will once again be shown. Click on the **[OK]** button to proceed.

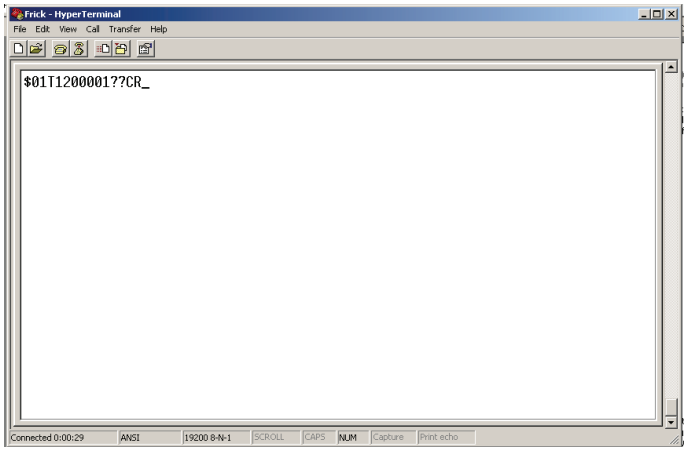


You will now be back to the main Hyperterminal communications screen. This screen will be blank. All communications, both from the computer, and to the computer (from the Quantum™). will appear on this screen. Proceed to the *Testing Communications* section.



Testing Communications

Set the keyboard for *CAPS* (so that all capital letters will be used). Type in the following command: $01T1200001??CR, then press **[ENTER]**. (This command will request the value of the Outside Air Temperature of Unit #1.)



If the communications is working properly, there should be an immediate response from the first Quantum™. The response should look something (but not necessarily exactly) like $A*0125434*.

If this portion of the test has passed, you can try to communicate to the next (or any Quantum™), by changing the value that you type into the HyperTerminal screen as follows:

Instead of **[#01]**, replace the *01* portion with the ID that you would like to access. For instance, if you wanted to talk to a fourth Quantum™ (ID 4), type in **[#04]**. This should return a message from that Quantum™.

This has been just a brief description of how to check your communications and verify that it is working. Greater detail can be found by consulting tables for each of the protocols in this manual.

General Notes

Ensure that the Quantum™ communications parameters are correct. This setup can be found on the ***Communications*** screen. This info must match that of the device that you are trying to talk to at the other end.

There are two red LED's associated with the Com-2 port on the Quantum™ (TX2 & RX2). Ensure that neither of these LED's are on continuously. If one or the other (or both) are on constantly, disconnect the Com cable. If the status of the LED's does not change, check the wiring connections to the comm port. Ensure that the wiring is not backwards. If the wiring is correct, power the Quantum™ down, then back up. If either or both of the LED's is still on, a bad driver chip may be suspected on the Quantum™, and the board should be replaced.

Once everything has been inspected (cables, jumpers, and setup), try to develop communications from the master. You should see the LED's on the Com-2 port flickering as the Quantum™ talks to the master. If nothing happens, it would be best to consult the *HyperTerminal* section of this manual for more detailed troubleshooting.

If no data appears, or if the data does not match the specific protocol requirements that you are using, then check the following:

- Verify that the communications wiring matches that shown in the drawings at the end of this manual.
- Access the ***Communications*** screen and verify that the Quantum™ ID is set to the same value that you are trying to access. Also, check that the baud rate matches that of the setup in the properties section of the Hyperterminal example.
- Verify the position of the jumpers by comparing them with the section entitled *Quantum™ Communications Jumpers*.
- Ensure that the data that you have entered in Hyperterminal, exactly matches the example.
- Go back through the *Setting up Hyperterminal* section, and ensure that it has been followed exactly. Repeat the process if necessary.
- If you are using a converter card (to convert the RS-232 signal from the computer to RS-422 or RS-485), then either verify that the converter card is working properly with a different piece of known functioning equipment, or eliminate it completely by tying into the Quantum™ directly through RS-232.
- The Communications port on the computer is bad. Try to verify this by communicating to a different piece of known good equipment.
- The Communications port on the Quantum™ is bad.

QUANTUM™ DATA TABLES

DIGITAL BOARD VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data	Digital Board #	Channel #	Module Type
1000	N10:0	41001	Refrigerant Pump 1 Output - Vessel 1	4	3	Output
1001	N10:1	41002	Refrigerant Pump 1 Output - Vessel 2	4	19	Output
1002	N10:2	41003	Refrigerant Pump 1 Output - Vessel 3	5	11	Output
1003	N10:3	41004	Refrigerant Pump 2 Output - Vessel 1	4	4	Output
1004	N10:4	41005	Refrigerant Pump 2 Output - Vessel 2	4	20	Output
1005	N10:5	41006	Refrigerant Pump 2 Output - Vessel 3	5	12	Output
1006	N10:6	41007	Refrigerant Pump 3 Output - Vessel 1	6	1	Output
1007	N10:7	41008	Refrigerant Pump 3 Output - Vessel 2	6	5	Output
1008	N10:8	41009	Refrigerant Pump 3 Output - Vessel 3	6	9	Output
1009	N10:9	41010	Refrigerant Pump 4 Output - Vessel 1	6	2	Output
1010	N10:10	41011	Refrigerant Pump 4 Output - Vessel 2	6	6	Output
1011	N10:11	41012	Refrigerant Pump 4 Output - Vessel 3	6	10	Output
1012	N10:12	41013	Operating Level 1 Input - Vessel 1	4	7	Input
1013	N10:13	41014	Operating Level 1 Input - Vessel 2	4	23	Input
1014	N10:14	41015	Operating Level 1 Input - Vessel 3	5	15	Input
1015	N10:15	41016	Operating Level 2 Input - Vessel 1	4	8	Input
1016	N10:16	41017	Operating Level 2 Input – Vessel 2	4	24	Input
1017	N10:17	41018	Operating Level 2 Input - Vessel 3	5	16	Input
1018	N10:18	41019	By-Pass Pump 1 Output - Vessel 1	6	0	Output
1019	N10:19	41020	By-Pass Pump 1 Output - Vessel 2	6	0	Output
1020	N10:20	41021	By-Pass Pump 1 Output - Vessel 3	6	0	Output
1021	N10:21	41022	By-Pass Pump 2 Output - Vessel 1	6	0	Output
1022	N10:22	41023	By-Pass Pump 2 Output - Vessel 2	6	0	Output
1023	N10:23	41024	By-Pass Pump 2 Output - Vessel 3	6	0	Output
1024	N10:24	41025	By-Pass Pump 3 Output - Vessel 1	6	0	Output
1025	N10:25	41026	By-Pass Pump 3 Output - Vessel 2	6	0	Output
1026	N10:26	41027	By-Pass Pump 3 Output - Vessel 3	6	0	Output
1027	N10:27	41028	By-Pass Pump 4 Output - Vessel 1	6	0	Output
1028	N10:28	41029	By-Pass Pump 4 Output - Vessel 2	6	0	Output
1029	N10:29	41030	By-Pass Pump 4 Output - Vessel 3	6	0	Output
1030	N10:30	41031	Compressor Running - Vessel 1	4	13	Input
1031	N10:31	41032	Compressor Running - Vessel 2	5	5	Input
1032	N10:32	41033	Compressor Running - Vessel 3	5	21	Input
1033	N10:33	41034	High Level Warning - Vessel 1	4	6	Input
1034	N10:34	41035	High Level Warning - Vessel 2	4	22	Input
1035	N10:35	41036	High Level Warning - Vessel 3	5	14	Input
1036	N10:36	41037	High Level Shutdown - Vessel 1	4	5	Input
1037	N10:37	41038	High Level Shutdown - Vessel 2	4	21	Input
1038	N10:38	41039	High Level Shutdown - Vessel 3	5	13	Input
1039	N10:39	41040	Low Level Warning - Vessel 1	4	9	Input
1040	N10:40	41041	Low Level Warning - Vessel 2	5	1	Input
1041	N10:41	41042	Low Level Warning - Vessel 3	5	17	Input
1042	N10:42	41043	Low Level Shutdown - Vessel 1	4	10	Input
1043	N10:43	41044	Low Level Shutdown - Vessel 2	5	2	Input

DIGITAL BOARD VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data	Digital Board #	Channel #	Module Type
1044	N10:44	41045	Low Level Shutdown - Vessel 3	5	18	Input
1045	N10:45	41046	Solenoid 1 Output - Vessel 1	4	1	Output
1046	N10:46	41047	Solenoid 1 Output - Vessel 2	4	17	Output
1047	N10:47	41048	Solenoid 1 Output - Vessel 3	5	9	Output
1048	N10:48	41049	Solenoid 2 Output - Vessel 1	4	2	Output
1049	N10:49	41050	Solenoid 2 Output - Vessel 2	4	18	Output
1050	N10:50	41051	Solenoid 2 Output - Vessel 3	5	10	Output
1051	N10:51	41052	Auxiliary Digital Input 1 - Vessel	4	15	Input
1052	N10:52	41053	Auxiliary Digital Input 2 - Vessel	5	6	Input
1053	N10:53	41054	Auxiliary Digital Input 3 - Vessel	5	7	Input
1054	N10:54	41055	Auxiliary Digital Input 4 - Vessel	5	22	Input
1055	N10:55	41056	Auxiliary Digital Input 5 - Vessel	5	23	Input
1056	N10:56	41057	Auxiliary Digital Input 6 - Vessel	5	0	Input
1057	N10:57	41058	Auxiliary Digital Input 7 - Vessel	6	0	Input
1058	N10:58	41059	Auxiliary Digital Input 8 - Vessel	6	0	Input
1059	N10:59	41060	Auxiliary Digital Input 9 - Vessel	6	0	Input
1060	N10:60	41061	Auxiliary Digital Input 10 - Vessel	6	0	Input
1061	N10:61	41062	Auxiliary Digital Input 11 - Vessel	6	0	Input
1062	N10:62	41063	Auxiliary Digital Input 12 - Vessel	6	0	Input
1063	N10:63	41064	Auxiliary Digital Input 13 - Vessel	6	0	Input
1064	N10:64	41065	Auxiliary Digital Input 14 - Vessel	6	0	Input
1065	N10:65	41066	Auxiliary Digital Input 15 - Vessel	6	0	Input
1066	N10:66	41067	Auxiliary Digital Input 16 - Vessel	6	0	Input
1067	N10:67	41068	Auxiliary Digital Input 17 - Vessel	6	0	Input
1068	N10:68	41069	Auxiliary Digital Input 18 - Vessel	6	0	Input
1070	N10:70	41071	Auxiliary Digital Output 1 - Vessel	4	16	Output
1071	N10:71	41072	Auxiliary Digital Output 2 - Vessel	5	8	Output
1072	N10:72	41073	Auxiliary Digital Output 3 - Vessel	5	24	Output
1073	N10:73	41074	Auxiliary Digital Output 4 - Vessel	6	0	Output
1074	N10:74	41075	Auxiliary Digital Output 5 - Vessel	6	0	Output
1075	N10:75	41076	Auxiliary Digital Output 6 - Vessel	6	0	Output
1076	N10:76	41077	Auxiliary Digital Output 7 - Vessel	6	0	Output
1077	N10:77	41078	Auxiliary Digital Output 8 - Vessel	6	0	Output
1078	N10:78	41079	Auxiliary Digital Output 9 - Vessel	6	0	Output
1079	N10:79	41080	Auxiliary Digital Output 10 - Vessel	6	0	Output
1080	N10:80	41081	Auxiliary Digital Output 11 - Vessel	6	0	Output
1081	N10:81	41082	Auxiliary Digital Output 12 - Vessel	6	0	Output
1082	N10:82	41083	Auxiliary Digital Output 13 - Vessel	6	0	Output
1083	N10:83	41084	Auxiliary Digital Output 14 - Vessel	6	0	Output
1084	N10:84	41085	Auxiliary Digital Output 15 - Vessel	6	0	Output
1085	N10:85	41086	Refrigerant Pump 1 Auxiliary Input - Vessel 1	4	11	Input
1086	N10:86	41087	Refrigerant Pump 1 Auxiliary Input - Vessel 2	5	3	Input
1087	N10:87	41088	Refrigerant Pump 1 Auxiliary Input - Vessel 3	5	19	Input
1088	N10:88	41089	Refrigerant Pump 2 Auxiliary Input - Vessel 1	4	12	Input

DIGITAL BOARD VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data	Digital Board #	Channel #	Module Type
1089	N10:89	41090	Refrigerant Pump 2 Auxiliary Input - Vessel 2	5	4	Input
1090	N10:90	41091	Refrigerant Pump 2 Auxiliary Input - Vessel 3	5	20	Input
1091	N10:91	41092	Refrigerant Pump 3 Auxiliary Input - Vessel 1	6	3	Input
1092	N10:92	41093	Refrigerant Pump 3 Auxiliary Input - Vessel 2	6	7	Input
1093	N10:93	41094	Refrigerant Pump 3 Auxiliary Input - Vessel 3	6	11	Input
1094	N10:94	41095	Refrigerant Pump 4 Auxiliary Input - Vessel 1	6	4	Input
1095	N10:95	41096	Refrigerant Pump 4 Auxiliary Input - Vessel 2	6	8	Input
1096	N10:96	41097	Refrigerant Pump 4 Auxiliary Input - Vessel 3	6	12	Input
1099	N10:99	41100	Alarm Output - Vessel	4	14	Output
1100	N10:100	41101	Step 1 Output - Condenser	1	1	Output
1101	N10:101	41102	Step 2 Output - Condenser	1	3	Output
1102	N10:102	41103	Step 3 Output - Condenser	1	5	Output
1103	N10:103	41104	Step 4 Output - Condenser	1	7	Output
1104	N10:104	41105	Step 5 Output - Condenser	1	9	Output
1105	N10:105	41106	Step 6 Output - Condenser	1	11	Output
1106	N10:106	41107	Step 7 Output - Condenser	1	13	Output
1107	N10:107	41108	Step 8 Output - Condenser	1	15	Output
1108	N10:108	41109	Step 9 Output - Condenser	1	17	Output
1109	N10:109	41110	Step 10 Output - Condenser	1	19	Output
1110	N10:110	41111	Step 11 Output - Condenser	1	21	Output
1111	N10:111	41112	Step 12 Output - Condenser	2	1	Output
1112	N10:112	41113	Step 13 Output - Condenser	2	3	Output
1113	N10:113	41114	Step 14 Output - Condenser	2	5	Output
1114	N10:114	41115	Step 15 Output - Condenser	2	7	Output
1115	N10:115	41116	Step 16 Output - Condenser	2	9	Output
1116	N10:116	41117	Step 17 Output - Condenser	2	11	Output
1117	N10:117	41118	Step 18 Output - Condenser	2	13	Output
1118	N10:118	41119	Step 19 Output - Condenser	2	15	Output
1119	N10:119	41120	Step 20 Output - Condenser	2	17	Output
1120	N10:120	41121	Step 21 Output - Condenser	2	19	Output
1121	N10:121	41122	Step 22 Output - Condenser	2	21	Output
1122	N10:122	41123	Step 23 Output - Condenser	2	23	Output
1123	N10:123	41124	Step 24 Output - Condenser	None	None	Output
1124	N10:124	41125	Step 1 Auxiliary Input - Condenser	1	2	Input
1125	N10:125	41126	Step 2 Auxiliary Input - Condenser	1	4	Input
1126	N10:126	41127	Step 3 Auxiliary Input - Condenser	1	6	Input
1127	N10:127	41128	Step 4 Auxiliary Input - Condenser	1	8	Input
1128	N10:128	41129	Step 5 Auxiliary Input - Condenser	1	10	Input
1129	N10:129	41130	Step 6 Auxiliary Input - Condenser	1	12	Input
1130	N10:130	41131	Step 7 Auxiliary Input - Condenser	1	14	Input
1131	N10:131	41132	Step 8 Auxiliary Input - Condenser	1	16	Input
1132	N10:132	41133	Step 9 Auxiliary Input - Condenser	1	18	Input
1133	N10:133	41134	Step 10 Auxiliary Input - Condenser	1	20	Input
1134	N10:134	41135	Step 11 Auxiliary Input - Condenser	1	22	Input

DIGITAL BOARD VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data	Digital Board #	Channel #	Module Type
1135	N10:135	41136	Step 12 Auxiliary Input - Condenser	2	2	Input
1136	N10:136	41137	Step 13 Auxiliary Input - Condenser	2	4	Input
1137	N10:137	41138	Step 14 Auxiliary Input - Condenser	2	6	Input
1138	N10:138	41139	Step 15 Auxiliary Input - Condenser	2	8	Input
1139	N10:139	41140	Step 16 Auxiliary Input - Condenser	2	10	Input
1140	N10:140	41141	Step 17 Auxiliary Input - Condenser	2	12	Input
1141	N10:141	41142	Step 18 Auxiliary Input - Condenser	2	14	Input
1142	N10:142	41143	Step 19 Auxiliary Input - Condenser	2	16	Input
1143	N10:143	41144	Step 20 Auxiliary Input - Condenser	2	18	Input
1144	N10:144	41145	Step 21 Auxiliary Input - Condenser	2	20	Input
1145	N10:145	41146	Step 22 Auxiliary Input - Condenser	2	22	Input
1146	N10:146	41147	Step 23 Auxiliary Input - Condenser	2	24	Input
1147	N10:147	41148	Step 24 Auxiliary Input - Condenser	None	None	Input
1150	N10:150	41151	Alarm Output - Condenser	1	23	Output
1151	N10:151	41152	Defrost Input - Condenser	1	24	Input
1170	N10:170	41171	Auxiliary Digital Input 1 - Condenser	None	None	Input
1171	N10:171	41172	Auxiliary Digital Input 2 - Condenser	None	None	Input
1172	N10:172	41173	Auxiliary Digital Input 3 - Condenser	None	None	Input
1173	N10:173	41174	Auxiliary Digital Input 4 - Condenser	None	None	Input
1174	N10:174	41175	Auxiliary Digital Input 5 - Condenser	None	None	Input
1175	N10:175	41176	Auxiliary Digital Input 6 - Condenser	None	None	Input
1176	N10:176	41177	Auxiliary Digital Input 7 - Condenser	None	None	Input
1177	N10:177	41178	Auxiliary Digital Input 8 - Condenser	None	None	Input
1178	N10:178	41179	Auxiliary Digital Input 9 - Condenser	None	None	Input
1179	N10:179	41180	Auxiliary Digital Input 10 - Condenser	None	None	Input
1180	N10:180	41181	Auxiliary Digital Input 11 - Condenser	None	None	Input
1190	N10:190	41191	Auxiliary Digital Output 1 - Condenser	None	None	Output
1191	N10:191	41192	Auxiliary Digital Output 2 - Condenser	None	None	Output
1192	N10:192	41193	Auxiliary Digital Output 3 - Condenser	None	None	Output
1193	N10:193	41194	Auxiliary Digital Output 4 - Condenser	None	None	Output
1194	N10:194	41195	Auxiliary Digital Output 5 - Condenser	None	None	Output
1195	N10:195	41196	Auxiliary Digital Output 6 - Condenser	None	None	Output
1196	N10:196	41197	Auxiliary Digital Output 7 - Condenser	None	None	Output
1197	N10:197	41198	Auxiliary Digital Output 8 - Condenser	None	None	Output
1198	N10:198	41199	Auxiliary Digital Output 9 - Condenser	None	None	Output
1199	N10:199	41200	Auxiliary Digital Output 10 - Condenser	None	None	Output
1200	N10:200	41201	Auxiliary Digital Output 11 - Condenser	None	None	Output

ANALOG BOARD VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data	Analog Board #	Channel #	Module Type
2000	N20:00	42001	Refrigerant Level - Vessel 1	2	1	Input
2001	N20:01	42002	Refrigerant Level - Vessel 2	2	2	Input
2002	N20:02	42003	Refrigerant Level - Vessel 3	2	3	Input
2003	N20:03	42004	Vessel Pressure - Vessel 1	2	4	Input
2004	N20:04	42005	Vessel Pressure - Vessel 2	2	5	Input
2005	N20:05	42006	Vessel Pressure - Vessel 3	2	6	Input
2006	N20:06	42007	Modulating Valve - Vessel 1	2	1	Output
2007	N20:07	42008	Modulating Valve - Vessel 2	2	2	Output
2008	N20:08	42009	Modulating Valve - Vessel 3	2	3	Output
2021	N20:21	42022	High-Side Pump 1 Pressure - Vessel 1	2	7	Input
2022	N20:22	42023	High-Side Pump 1 Pressure - Vessel 2	2	8	Input
2023	N20:23	42024	High-Side Pump 1 Pressure - Vessel 3	2	9	Input
2024	N20:24	42025	High-Side Pump 2 Pressure - Vessel 1	2	13	Input
2025	N20:25	42026	High-Side Pump 2 Pressure - Vessel 2	2	14	Input
2026	N20:26	42027	High-Side Pump 2 Pressure - Vessel 3	2	15	Input
2027	N20:27	42028	High-Side Pump 3 Pressure - Vessel 1	3	1	Input
2028	N20:28	42029	High-Side Pump 3 Pressure - Vessel 2	3	2	Input
2029	N20:29	42030	High-Side Pump 3 Pressure - Vessel 3	3	3	Input
2030	N20:30	42031	High-Side Pump 4 Pressure - Vessel 1	3	7	Input
2031	N20:31	42032	High-Side Pump 4 Pressure - Vessel 2	3	8	Input
2032	N20:32	42033	High-Side Pump 4 Pressure - Vessel 3	3	9	Input
2033	N20:33	42034	Low-Side Pump 1 Pressure - Vessel 1	2	10	Input
2034	N20:34	42035	Low-Side Pump 1 Pressure - Vessel 2	2	11	Input
2035	N20:35	42036	Low-Side Pump 1 Pressure - Vessel 3	2	12	Input
2036	N20:36	42037	Low-Side Pump 2 Pressure - Vessel 1	2	16	Input
2037	N20:37	42038	Low-Side Pump 2 Pressure - Vessel 2	2	17	Input
2038	N20:38	42039	Low-Side Pump 2 Pressure - Vessel 3	2	18	Input
2039	N20:39	42040	Low-Side Pump 3 Pressure - Vessel 1	3	4	Input
2040	N20:40	42041	Low-Side Pump 3 Pressure - Vessel 2	3	5	Input
2041	N20:41	42042	Low-Side Pump 3 Pressure - Vessel 3	3	6	Input
2042	N20:42	42043	Low-Side Pump 4 Pressure - Vessel 1	3	10	Input
2043	N20:43	42044	Low-Side Pump 4 Pressure - Vessel 2	3	11	Input
2044	N20:44	42045	Low-Side Pump 4 Pressure - Vessel 3	3	12	Input
2046	N20:46	42047	Auxiliary Analog Output 1 - Vessel	2	4	Output
2047	N20:47	42048	Auxiliary Analog Output 2 - Vessel	2	5	Output
2048	N20:48	42049	Auxiliary Analog Output 3 - Vessel	2	6	Output
2049	N20:49	42050	Auxiliary Analog Output 4 - Vessel	2	7	Output
2054	N20:54	42055	Auxiliary Analog Input 1 - Vessel	2	19	Input
2055	N20:55	42056	Auxiliary Analog Input 2 - Vessel	2	20	Input
2056	N20:56	42057	Auxiliary Analog Input 3 - Vessel	2	21	Input
2057	N20:57	42058	Auxiliary Analog Input 4 - Vessel	2	22	Input
2058	N20:58	42059	Auxiliary Analog Input 5 - Vessel	2	23	Input

ANALOG BOARD VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data	Analog Board #	Channel #	Module Type
2059	N20:59	42060	Auxiliary Analog Input 6 - Vessel	2	24	Input
2060	N20:60	42061	Auxiliary Analog Input 7 - Vessel	3	13	Input
2061	N20:61	42062	Auxiliary Analog Input 8 - Vessel	3	14	Input
2062	N20:62	42063	Auxiliary Analog Input 9 - Vessel	3	15	Input
2063	N20:63	42064	Auxiliary Analog Input 10 - Vessel	3	16	Input
2064	N20:64	42065	Auxiliary Analog Input 11 - Vessel	3	17	Input
2065	N20:65	42066	Auxiliary Analog Input 12 - Vessel	3	18	Input
2070	N20:70	42071	Pressure Condenser	1	1	Input
2071	N20:71	42072	Outside Air Temperature - Condenser	1	2	Input
2072	N20:72	42073	Outside Air Humidity - Condenser	1	3	Input
2074	N20:74	42075	Variable Fan Speed 1 - Condenser	1	1	Output
2075	N20:75	42076	Variable Fan Speed 2 - Condenser	1	2	Output
2076	N20:76	42077	Variable Fan Speed 3 - Condenser	1	3	Output
2077	N20:77	42078	Variable Fan Speed 4 - Condenser	1	4	Output
2078	N20:78	42079	Variable Fan Speed 5 - Condenser	1	5	Output
2079	N20:79	42080	Variable Fan Speed 6 - Condenser	1	6	Output
2080	N20:80	42081	Variable Fan Speed 7 - Condenser	1	7	Output
2081	N20:81	42082	Variable Fan Speed 8 - Condenser	1	8	Output
2082	N20:82	42083	Auxiliary Analog Output 1 - Condenser	None	None	Output
2083	N20:83	42084	Auxiliary Analog Output 2 - Condenser	None	None	Output
2084	N20:84	42085	Auxiliary Analog Output 3 - Condenser	None	None	Output
2085	N20:85	42086	Auxiliary Analog Output 4 - Condenser	None	None	Output
2090	N20:90	42091	Auxiliary Analog Input 1 - Condenser	1	4	Input
2091	N20:91	42092	Auxiliary Analog Input 2 - Condenser	1	5	Input
2092	N20:92	42093	Auxiliary Analog Input 3 - Condenser	1	6	Input
2093	N20:93	42094	Auxiliary Analog Input 4 - Condenser	1	7	Input
2094	N20:94	42095	Auxiliary Analog Input 5 - Condenser	1	8	Input
2095	N20:95	42096	Auxiliary Analog Input 6 - Condenser	1	9	Input
2096	N20:96	42097	Auxiliary Analog Input 7 - Condenser	1	10	Input
2097	N20:97	42098	Auxiliary Analog Input 8 - Condenser	1	11	Input
2098	N20:98	42099	Auxiliary Analog Input 9 - Condenser	1	12	Input
2099	N20:99	42100	Auxiliary Analog Input 10 - Condenser	1	13	Input
2100	N20:100	42101	Auxiliary Analog Input 11 - Condenser	1	14	Input
2101	N20:101	42102	Auxiliary Analog Input 12 - Condenser	1	15	Input
2102	N20:102	42103	Auxiliary Analog Input 13 - Condenser	1	16	Input
2103	N20:103	42104	Auxiliary Analog Input 14 - Condenser	1	17	Input
2104	N20:104	42105	Auxiliary Analog Input 15 - Condenser	1	18	Input
2105	N20:105	42106	Auxiliary Analog Input 16 - Condenser	1	19	Input
2106	N20:106	42107	Auxiliary Analog Input 17 - Condenser	1	20	Input
2107	N20:107	42108	Auxiliary Analog Input 18 - Condenser	1	21	Input
2108	N20:108	42109	Auxiliary Analog Input 19 - Condenser	1	22	Input
2109	N20:109	42110	Auxiliary Analog Input 20 - Condenser	1	23	Input

CALCULATED VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data	Value Code
3063	N30:63	43064	Panel Temperature	Temperature
3100	N30:100	43101	Current Safety Number 1 – Condenser	Integer
3101	N30:101	43102	Current Safety Number 1 – Vessel 1	Integer
3102	N30:102	43103	Current Safety Number 1 – Vessel 2	Integer
3103	N30:103	43104	Current Safety Number 1 – Vessel 3	Integer
3104	N30:104	43105	Current Safety Number 2 – Condenser	Integer
3105	N30:105	43106	Current Safety Number 2 – Vessel 1	Integer
3106	N30:106	43107	Current Safety Number 2 – Vessel 2	Integer
3107	N30:107	43108	Current Safety Number 2 – For Vessel 3	Integer
3108	N30:108	43109	Current Safety Number 3 – Condenser	Integer
3109	N30:109	43110	Current Safety Number 3 – Vessel 1	Integer
3110	N30:110	43111	Current Safety Number 3 – Vessel 2	Integer
3111	N30:111	43112	Current Safety Number 3 – Vessel 3	Integer
3112	N30:112	43113	Current Safety Number 4 – Condenser	Integer
3113	N30:113	43114	Current Safety Number 4 – Vessel 1	Integer
3114	N30:114	43115	Current Safety Number 4 – Vessel 2	Integer
3115	N30:115	43116	Current Safety Number 4 – Vessel 3	Integer
3116	N30:116	43117	Current Safety Number 5 – Condenser	Integer
3117	N30:117	43118	Current Safety Number 5 – Vessel 1	Integer
3118	N30:118	43119	Current Safety Number 5 – Vessel 2	Integer
3119	N30:119	43120	Current Safety Number 5 – Vessel 3	Integer
3120	N30:120	43121	Current Safety Number 6 – Condenser	Integer
3121	N30:121	43122	Current Safety Number 6 – Vessel 1	Integer
3122	N30:122	43123	Current Safety Number 6 – Vessel 2	Integer
3123	N30:123	43124	Current Safety Number 6 – Vessel 3	Integer
3124	N30:124	43125	Current Safety Number 7 – Condenser	Integer
3125	N30:125	43126	Current Safety Number 7 – Vessel 1	Integer
3126	N30:126	43127	Current Safety Number 7 – Vessel 2	Integer
3127	N30:127	43128	Current Safety Number 7 – Vessel 3	Integer
3128	N30:128	43129	Current Safety Number 8 – Condenser	Integer
3129	N30:129	43130	Current Safety Number 8 – Vessel 1	Integer
3130	N30:130	43131	Current Safety Number 8 – Vessel 2	Integer
3131	N30:131	43132	Current Safety Number 8 – Vessel 3	Integer
3132	N30:132	43133	Current Safety Number 9 – Condenser	Integer
3133	N30:133	43134	Current Safety Number 9 – Vessel 1	Integer
3134	N30:134	43135	Current Safety Number 9 – Vessel 2	Integer
3135	N30:135	43136	Current Safety Number 9 – Vessel 3	Integer
3150	N30:150	43151	Control Setpoint - Condenser	Pressure
3152	N30:152	43153	Variable Fan Speed	Percent%

CALCULATED VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data	Value Code
3160	N30:160	43161	Total Runtime Hours Pump 1 - Vessel 1	Hours
3161	N30:161	43162	Total Runtime Hours Pump 1 - Vessel 2	Hours
3162	N30:162	43163	Total Runtime Hours Pump 1 - Vessel 3	Hours
3163	N30:163	43164	Total Runtime Hours Pump 2 - Vessel 1	Hours
3164	N30:164	43165	Total Runtime Hours Pump 2 - Vessel 2	Hours
3165	N30:165	43166	Total Runtime Hours Pump 2 - Vessel 3	Hours
3166	N30:166	43167	Total Runtime Hours Pump 3 - Vessel 1	Hours
3167	N30:167	43168	Total Runtime Hours Pump 3 - Vessel 2	Hours
3168	N30:168	43169	Total Runtime Hours Pump 3 - Vessel 3	Hours
3169	N30:169	43170	Total Runtime Hours Pump 4 - Vessel 1	Hours
3170	N30:170	43171	Total Runtime Hours Pump 4 - Vessel 2	Hours
3171	N30:171	43172	Total Runtime Hours Pump 4 - Vessel 3	Hours
3180	N30:180	43181	Pump 1 Differential Pressure - Vessel 1	Pressure (Magnitude)
3181	N30:181	43182	Pump 1 Differential Pressure - Vessel 2	Pressure (Magnitude)
3182	N30:182	43183	Pump 1 Differential Pressure - Vessel 3	Pressure (Magnitude)
3183	N30:183	43184	Pump 2 Differential Pressure - Vessel 1	Pressure (Magnitude)
3184	N30:184	43185	Pump 2 Differential Pressure - Vessel 2	Pressure (Magnitude)
3185	N30:185	43186	Pump 2 Differential Pressure - Vessel 3	Pressure (Magnitude)
3186	N30:186	43187	Pump 3 Differential Pressure - Vessel 1	Pressure (Magnitude)
3187	N30:187	43188	Pump 3 Differential Pressure - Vessel 2	Pressure (Magnitude)
3188	N30:188	43189	Pump 3 Differential Pressure - Vessel 3	Pressure (Magnitude)
3189	N30:189	43190	Pump 4 Differential Pressure - Vessel 1	Pressure (Magnitude)
3190	N30:190	43191	Pump 4 Differential Pressure - Vessel 2	Pressure (Magnitude)
3191	N30:191	43192	Pump 4 Differential Pressure - Vessel 3	Pressure (Magnitude)

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4001	N40:01	44002	W	Reset Total Run Time Pump 1 - Vessel 1	0 = False 1 = True
4002	N40:02	44003	W	Reset Total Run Time Pump 1 - Vessel 2	
4003	N40:03	44004	W	Reset Total Run Time Pump 1 - Vessel 3	
4004	N40:04	44005	W	Reset Total Run Time Pump 2 - Vessel 1	
4005	N40:05	44006	W	Reset Total Run Time Pump 2 - Vessel 2	
4006	N40:06	44007	W	Reset Total Run Time Pump 2 - Vessel 3	
4007	N40:07	44008	W	Reset Total Run Time Pump 3 - Vessel 1	
4008	N40:08	44009	W	Reset Total Run Time Pump 3 - Vessel 2	
4009	N40:09	44010	W	Reset Total Run Time Pump 3 - Vessel 3	
4010	N40:10	44011	W	Reset Total Run Time Pump 4 - Vessel 1	
4011	N40:11	44012	W	Reset Total Run Time Pump 4 - Vessel 2	
4012	N40:12	44013	W	Reset Total Run Time Pump 4 - Vessel 3	
4025	N40:25	44026	R	Refrigerant Pump 1 Status - Vessel 1	0 = Pump Off 1 = Pump Running 2 = Pump Shutdown 3 = Pump Failed 4 = Pump Off - Compressor
4026	N40:26	44027	R	Refrigerant Pump 1 Status - Vessel 2	
4027	N40:27	44028	R	Refrigerant Pump 1 Status - Vessel 3	
4028	N40:28	44029	R	Refrigerant Pump 2 Status - Vessel 1	
4029	N40:29	44030	R	Refrigerant Pump 2 Status - Vessel 2	
4030	N40:30	44031	R	Refrigerant Pump 2 Status - Vessel 3	
4031	N40:31	44032	R	Refrigerant Pump 3 Status - Vessel 1	
4032	N40:32	44033	R	Refrigerant Pump 3 Status - Vessel 2	
4033	N40:33	44034	R	Refrigerant Pump 3 Status - Vessel 3	
4034	N40:34	44035	R	Refrigerant Pump 4 Status - Vessel 1	
4035	N40:35	44036	R	Refrigerant Pump 4 Status - Vessel 2	
4036	N40:36	44037	R	Refrigerant Pump 4 Status - Vessel 3	
4044	N40:44	44045	R	Auto-Toggle Pumps - Vessel 1	0 = Disabled 1 = Enabled
4045	N40:45	44046	R	Auto-Toggle Pumps - Vessel 2	
4046	N40:46	44047	R	Auto-Toggle Pumps - Vessel 3	
4047	N40:47	44048	R/W	Master Pump Switch - Vessel 1	0 = Switch Off 1 = Switch On
4048	N40:48	44049	R/W	Master Pump Switch - Vessel 2	
4049	N40:49	44050	R/W	Master Pump Switch - Vessel 3	
4050	N40:50	44051	W	Clear Safeties - Condenser	0 = No 1 = Yes
4051	N40:51	44052	W	Clear Safeties - Vessel 1	
4052	N40:52	44053	W	Clear Safeties - Vessel 2	
4053	N40:53	44054	W	Clear Safeties - Vessel 3	
4054	N40:54	44055	W	Clear Safety History - Condenser	
4055	N40:55	44056	W	Clear Safety History - Vessel 1	
4056	N40:56	44057	W	Clear Safety History - Vessel 2	
4057	N40:57	44058	W	Clear Safety History - Vessel 3	
4058	N40:58	44059	R/W	Refrigeration Pump 1 Configuration - Vessel 1	0 = Disabled 1 = Enabled
4059	N40:59	44060	R/W	Refrigeration Pump 1 Configuration - Vessel 2	
4060	N40:60	44061	R/W	Refrigeration Pump 1 Configuration - Vessel 3	
4061	N40:61	44062	R/W	Refrigeration Pump 2 Configuration - Vessel 1	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4062	N40:62	44063	R/W	Refrigeration Pump 2 Configuration - Vessel 2	
4063	N40:63	44064	R/W	Refrigeration Pump 2 Configuration - Vessel 3	
4064	N40:64	44065	R/W	Refrigeration Pump 3 Configuration - Vessel 1	
4065	N40:65	44066	R/W	Refrigeration Pump 3 Configuration - Vessel 2	
4066	N40:66	44067	R/W	Refrigeration Pump 3 Configuration - Vessel 3	
4067	N40:67	44068	R/W	Refrigeration Pump 4 Configuration - Vessel 1	
4068	N40:68	44069	R/W	Refrigeration Pump 4 Configuration - Vessel 2	
4069	N40:69	44070	R/W	Refrigeration Pump 4 Configuration - Vessel 3	
4070	N40:70	44071	R/W	Target Number of Running Pumps - Vessel 1	1 = 1 Pump 2 = 2 Pumps 3 = 3 Pumps 4 = 4 Pumps
4071	N40:71	44072	R/W	Target Number of Running Pumps - Vessel 2	
4072	N40:72	44073	R/W	Target Number of Running Pumps - Vessel 3	
4078	N40:78	44079	R	Unit State - Condenser	0 = Disabled 1 = Enabled
4079	N40:79	44080	R	Unit State - Vessel 1	
4080	N40:80	44081	R	Unit State - Vessel 2	
4081	N40:81	44082	R	Unit State - Vessel 3	
4082	N40:82	44083	R	Compressor Run Configuration - Vessel 1	
4083	N40:83	44084	R	Compressor Run Configuration - Vessel 2	
4084	N40:84	44085	R	Compressor Run Configuration - Vessel 3	
4085	N40:85	44086	R	Digital Level Control Source - Vessel 1	0 = No Control 1 = Analog Control 2 = Digital Control
4086	N40:86	44087	R	Digital Level Control Source - Vessel 2	
4087	N40:87	44088	R	Digital Level Control Source - Vessel 3	
4088	N40:88	44089	R	Analog Level Control Source - Vessel 1	0 = No Control 1 = Analog Control
4089	N40:89	44090	R	Analog Level Control Source - Vessel 2	
4090	N40:90	44091	R	Analog Level Control Source - Vessel 3	
4103	N41:03	44104	R	High Digital Level Shutdown Configuration - Vessel 1	0 = Disabled 1 = Enabled
4104	N41:04	44105	R	High Digital Level Shutdown Configuration - Vessel 2	
4105	N41:05	44106	R	High Digital Level Shutdown Configuration - Vessel 3	
4106	N41:06	44107	R	High Digital Level Warning Configuration - Vessel 1	
4107	N41:07	44108	R	High Digital Level Warning Configuration - Vessel 2	
4108	N41:08	44109	R	High Digital Level Warning Configuration - Vessel 3	
4109	N41:09	44110	R	Low Digital Level Shutdown Configuration - Vessel 1	
4110	N41:10	44111	R	Low Digital Level Shutdown Configuration - Vessel 2	
4111	N41:11	44112	R	Low Digital Level Shutdown Configuration - Vessel 3	
4112	N41:12	44113	R	Low Digital Level Warning Configuration - Vessel 1	
4113	N41:13	44114	R	Low Digital Level Warning Configuration - Vessel 2	
4114	N41:14	44115	R	Low Digital Level Warning Configuration - Vessel 3	
4115	N41:15	44116	R	Refrigerant Level Alarm Configuration - Vessel 1	
4116	N41:16	44117	R	Refrigerant Level Alarm Configuration - Vessel 2	
4117	N41:17	44118	R	Refrigerant Level Alarm Configuration - Vessel 3	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4118	N41:18	44119	R	HMI Level Status Vessel 1	0 = Normal 1 = High Shutdown 2 = High Warning 3 = Low Warning 4 = Low Shutdown
4119	N41:19	44120	R	HMI Level Status Vessel 2	
4120	N41:20	44121	R	HMI Level Status Vessel 3	
4121	N41:21	44122	R	Refrigeration Pump 1 Differential Pressure Config. - Vessel 1	0 = Disabled 1 = Enabled
4122	N41:22	44123	R	Refrigeration Pump 1 Differential Pressure Config. - Vessel 2	
4123	N41:23	44124	R	Refrigeration Pump 1 Differential Pressure Config. - Vessel 3	
4124	N41:24	44125	R	Refrigeration Pump 2 Differential Pressure Config. - Vessel 1	
4125	N41:25	44126	R	Refrigeration Pump 2 Differential Pressure Config. - Vessel 2	
4126	N41:26	44127	R	Refrigeration Pump 2 Differential Pressure Config. - Vessel 3	
4127	N41:27	44128	R	Refrigeration Pump 3 Differential Pressure Config. - Vessel 1	
4128	N41:28	44129	R	Refrigeration Pump 3 Differential Pressure Config. - Vessel 2	
4129	N41:29	44130	R	Refrigeration Pump 3 Differential Pressure Config. - Vessel 3	
4130	N41:30	44131	R	Refrigeration Pump 4 Differential Pressure Config. - Vessel 1	
4131	N41:31	44132	R	Refrigeration Pump 4 Differential Pressure Config. - Vessel 2	
4132	N41:32	44133	R	Refrigeration Pump 4 Differential Pressure Config. - Vessel 3	
4133	N41:33	44134	R/W	Toggle Pumps Requested Vessel 1	0 = False 1 = True
4134	N41:34	44135	R/W	Toggle Pumps Requested Vessel 2	
4135	N41:35	44136	R/W	Toggle Pumps Requested Vessel 3	
4154	N41:54	44155	R	Refrigerant Pump 1 Auxiliary Alarm Configuration Vessel 1	0 = Disabled 1 = Enabled
4155	N41:55	44156	R	Refrigerant Pump 1 Auxiliary Alarm Configuration Vessel 2	
4156	N41:56	44157	R	Refrigerant Pump 1 Auxiliary Alarm Configuration Vessel 3	
4157	N41:57	44158	R	Refrigerant Pump 2 Auxiliary Alarm Configuration Vessel 1	
4158	N41:58	44159	R	Refrigerant Pump 2 Auxiliary Alarm Configuration Vessel 2	
4159	N41:59	44160	R	Refrigerant Pump 2 Auxiliary Alarm Configuration Vessel 3	
4160	N41:60	44161	R	Refrigerant Pump 3 Auxiliary Alarm Configuration Vessel 1	
4161	N41:61	44162	R	Refrigerant Pump 3 Auxiliary Alarm Configuration Vessel 2	
4162	N41:62	44163	R	Refrigerant Pump 3 Auxiliary Alarm Configuration Vessel 3	
4163	N41:63	44164	R	Refrigerant Pump 4 Auxiliary Alarm Configuration Vessel 1	
4164	N41:64	44165	R	Refrigerant Pump 4 Auxiliary Alarm Configuration Vessel 2	
4165	N41:65	44166	R	Refrigerant Pump 4 Auxiliary Alarm Configuration Vessel 3	
4190	N41:90	44191	R	Warning Condenser	0 = No Warning 1 = Warning
4191	N41:91	44192	R	Warning Vessel 1	
4192	N41:92	44193	R	Warning Vessel 2	
4193	N41:93	44194	R	Warning Vessel 3	
4194	N41:94	44195	R	Shutdown Condenser	0 = No Shutdowns 1 = Shutdown
4195	N41:95	44196	R	Shutdown Vessel 1	
4196	N41:96	44197	R	Shutdown Vessel 2	
4197	N41:97	44198	R	Shutdown Vessel 3	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4200	N42:00	44201	R	Mode Condenser	0 = Mode - Summer 1 = Mode - Winter
4201	N42:01	44202	R	Status Condenser	0 = Status – Normal 1 = Status - Defrost
4202	N42:02	44203	R/W	User Requested Control Condenser	0 = Manual 1 = Automatic
4203	N42:03	44204	R	Defrost Input Configuration - Condenser	0 = Disabled 1 = Enabled
4204	N42:04	44205	R	Sensor Fault Configuration - Condenser	0 = No Change 1 = All Steps On
4208	N42:08	44209	R/W	Override Action Requested Condenser	0 = No Override 1 = All On 2 = All Off 3 = Pumps Off
4209	N42:09	44210	R/W	User Requested Mode Condenser	0 = Mode Summer 1 = Mode Winter
4210	N42:10	44211	R	Step 1 Position Type Condenser	0 = Step Disabled 1 = Single Speed Fan 2 = Two Speed Fan Low 3 = Two Speed Fan High 4 = Variable Speed Fan 5 = Water Pump
4211	N42:11	44212	R	Step 2 Position Type Condenser	
4212	N42:12	44213	R	Step 3 Position Type Condenser	
4213	N42:13	44214	R	Step 4 Position Type Condenser	
4214	N42:14	44215	R	Step 5 Position Type Condenser	
4215	N42:15	44216	R	Step 6 Position Type Condenser	
4216	N42:16	44217	R	Step 7 Position Type Condenser	
4217	N42:17	44218	R	Step 8 Position Type Condenser	
4218	N42:18	44219	R	Step 9 Position Type Condenser	
4219	N42:19	44220	R	Step 10 Position Type Condenser	
4220	N42:20	44221	R	Step 11 Position Type Condenser	
4221	N42:21	44222	R	Step 12 Position Type Condenser	
4222	N42:22	44223	R	Step 13 Position Type Condenser	
4223	N42:23	44224	R	Step 14 Position Type Condenser	
4224	N42:24	44225	R	Step 15 Position Type Condenser	
4225	N42:25	44226	R	Step 16 Position Type Condenser	
4226	N42:26	44227	R	Step 17 Position Type Condenser	
4227	N42:27	44228	R	Step 18 Position Type Condenser	
4228	N42:28	44229	R	Step 19 Position Type Condenser	
4229	N42:29	44230	R	Step 20 Position Type Condenser	
4230	N42:30	44231	R	Step 21 Position Type Condenser	
4231	N42:31	44232	R	Step 22 Position Type Condenser	
4232	N42:32	44233	R	Step 23 Position Type Condenser	
4233	N42:33	44234	R	Step 24 Position Type Condenser	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4240	N42:40	44241	R	Step 1 Auxiliary Configuration – Condenser	0 = Disabled 1 = Enabled
4241	N42:41	44242	R	Step 2 Auxiliary Configuration – Condenser	
4242	N42:42	44243	R	Step 3 Auxiliary Configuration – Condenser	
4243	N42:43	44244	R	Step 4 Auxiliary Configuration – Condenser	
4244	N42:44	44245	R	Step 5 Auxiliary Configuration – Condenser	
4245	N42:45	44246	R	Step 6 Auxiliary Configuration – Condenser	
4246	N42:46	44247	R	Step 7 Auxiliary Configuration – Condenser	
4247	N42:47	44248	R	Step 8 Auxiliary Configuration – Condenser	
4248	N42:48	44249	R	Step 9 Auxiliary Configuration – Condenser	
4249	N42:49	44250	R	Step 10 Auxiliary Configuration – Condenser	
4250	N42:50	44251	R	Step 11 Auxiliary Configuration – Condenser	
4251	N42:51	44252	R	Step 12 Auxiliary Configuration – Condenser	
4252	N42:52	44253	R	Step 13 Auxiliary Configuration – Condenser	
4253	N42:53	44254	R	Step 14 Auxiliary Configuration – Condenser	
4254	N42:54	44255	R	Step 15 Auxiliary Configuration – Condenser	
4255	N42:55	44256	R	Step 16 Auxiliary Configuration – Condenser	
4256	N42:56	44257	R	Step 17 Auxiliary Configuration – Condenser	
4257	N42:57	44258	R	Step 18 Auxiliary Configuration – Condenser	
4258	N42:58	44259	R	Step 19 Auxiliary Configuration – Condenser	
4259	N42:59	44260	R	Step 20 Auxiliary Configuration – Condenser	
4260	N42:60	44261	R	Step 21 Auxiliary Configuration – Condenser	
4261	N42:61	44262	R	Step 22 Auxiliary Configuration – Condenser	
4262	N42:62	44263	R	Step 23 Auxiliary Configuration – Condenser	
4263	N42:63	44264	R	Step 24 Auxiliary Configuration – Condenser	
4320	N43:20	44321	R	Step 1 Status Condenser	0 = Step - Off 1 = Step - On 2 = Step - Failed
4321	N43:21	44322	R	Step 2 Status Condenser	
4322	N43:22	44323	R	Step 3 Status Condenser	
4323	N43:23	44324	R	Step 4 Status Condenser	
4324	N43:24	44325	R	Step 5 Status Condenser	
4325	N43:25	44326	R	Step 6 Status Condenser	
4326	N43:26	44327	R	Step 7 Status Condenser	
4327	N43:27	44328	R	Step 8 Status Condenser	
4328	N43:28	44329	R	Step 9 Status Condenser	
4329	N43:29	44330	R	Step 10 Status Condenser	
4330	N43:30	44331	R	Step 11 Status Condenser	
4331	N43:31	44332	R	Step 12 Status Condenser	
4332	N43:32	44333	R	Step 13 Status Condenser	
4333	N43:33	44334	R	Step 14 Status Condenser	
4334	N43:34	44335	R	Step 15 Status Condenser	
4335	N43:35	44336	R	Step 16 Status Condenser	
4336	N43:36	44337	R	Step 17 Status Condenser	
4337	N43:37	44338	R	Step 18 Status Condenser	
4338	N43:38	44339	R	Step 19 Status Condenser	
4339	N43:39	44340	R	Step 20 Status Condenser	
4340	N43:40	44341	R	Step 21 Status Condenser	
4341	N43:41	44342	R	Step 22 Status Condenser	
4342	N43:42	44343	R	Step 23 Status Condenser	
4343	N43:43	44344	R	Step 23 Status Condenser	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4440	N44:40	44441	R	Step 1 Variable Fan Position List	0 = Output A 1 = Output B 2 = Output C 3 = Output D 4 = Output E 5 = Output F 6 = Output G 7 = Output H
4441	N44:41	44442	R	Step 2 Variable Fan Position List	
4442	N44:42	44443	R	Step 3 Variable Fan Position List	
4443	N44:43	44444	R	Step 4 Variable Fan Position List	
4444	N44:44	44445	R	Step 5 Variable Fan Position List	
4445	N44:45	44446	R	Step 6 Variable Fan Position List	
4446	N44:46	44447	R	Step 7 Variable Fan Position List	
4447	N44:47	44448	R	Step 8 Variable Fan Position List	
4448	N44:48	44449	R	Step 9 Variable Fan Position List	
4449	N44:49	44450	R	Step 10 Variable Fan Position List	
4450	N44:50	44451	R	Step 11 Variable Fan Position List	
4451	N44:51	44452	R	Step 12 Variable Fan Position List	
4452	N44:52	44453	R	Step 13 Variable Fan Position List	
4453	N44:53	44454	R	Step 14 Variable Fan Position List	
4454	N44:54	44455	R	Step 15 Variable Fan Position List	
4455	N44:55	44456	R	Step 16 Variable Fan Position List	
4456	N44:56	44457	R	Step 17 Variable Fan Position List	
4457	N44:57	44458	R	Step 18 Variable Fan Position List	
4458	N44:58	44459	R	Step 19 Variable Fan Position List	
4459	N44:59	44460	R	Step 20 Variable Fan Position List	
4460	N44:60	44461	R	Step 21 Variable Fan Position List	
4461	N44:61	44462	R	Step 22 Variable Fan Position List	
4462	N44:62	44463	R	Step 23 Variable Fan Position List	
4463	N44:63	44464	R	Step 24 Variable Fan Position List	
4464	N44:64	44465	R	Step 1 Water Pump Override Configuration	0 = Disabled 1 = Enabled
4465	N44:65	44466	R	Step 2 Water Pump Override Configuration	
4466	N44:66	44467	R	Step 3 Water Pump Override Configuration	
4467	N44:67	44468	R	Step 4 Water Pump Override Configuration	
4468	N44:68	44469	R	Step 5 Water Pump Override Configuration	
4469	N44:69	44470	R	Step 6 Water Pump Override Configuration	
4470	N44:70	44471	R	Step 7 Water Pump Override Configuration	
4471	N44:71	44472	R	Step 8 Water Pump Override Configuration	
4472	N44:72	44473	R	Step 9 Water Pump Override Configuration	
4473	N44:73	44474	R	Step 10 Water Pump Override Configuration	
4474	N44:74	44475	R	Step 11 Water Pump Override Configuration	
4475	N44:75	44476	R	Step 12 Water Pump Override Configuration	
4476	N44:76	44477	R	Step 13 Water Pump Override Configuration	
4477	N44:77	44478	R	Step 14 Water Pump Override Configuration	
4478	N44:78	44479	R	Step 15 Water Pump Override Configuration	
4479	N44:79	44480	R	Step 16 Water Pump Override Configuration	
4480	N44:80	44481	R	Step 17 Water Pump Override Configuration	
4481	N44:81	44482	R	Step 18 Water Pump Override Configuration	
4482	N44:82	44483	R	Step 19 Water Pump Override Configuration	
4483	N44:83	44484	R	Step 20 Water Pump Override Configuration	
4484	N44:84	44485	R	Step 21 Water Pump Override Configuration	
4485	N44:85	44486	R	Step 22 Water Pump Override Configuration	
4486	N44:86	44487	R	Step 23 Water Pump Override Configuration	
4487	N44:87	44488	R	Step 24 Water Pump Override Configuration	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4566	N45:66	44587	R/W	Communications Units Flag	0 = Celsius, PSIA 1 = Panel Units
4587	N45:87	44588	R	Pump Bypass Control - Vessel 1 - Pump 1	0 = Disabled 1 = Enabled
4588	N45:88	44589	R	Pump Bypass Control - Vessel 2 - Pump 1	
4589	N45:89	44590	R	Pump Bypass Control - Vessel 3 - Pump 1	
4590	N45:90	44591	R	Pump Bypass Control - Vessel 1 - Pump 2	
4591	N45:91	44592	R	Pump Bypass Control - Vessel 2 - Pump 2	
4592	N45:92	44593	R	Pump Bypass Control - Vessel 3 - Pump 2	
4593	N45:93	44594	R	Pump Bypass Control - Vessel 1 - Pump 3	
4594	N45:94	44595	R	Pump Bypass Control - Vessel 2 - Pump 3	
4595	N45:95	44596	R	Pump Bypass Control - Vessel 3 - Pump 3	
4596	N45:96	44597	R	Pump Bypass Control - Vessel 1 - Pump 4	
4597	N45:97	44598	R	Pump Bypass Control - Vessel 2 - Pump 4	
4598	N45:98	44599	R	Pump Bypass Control - Vessel 3 - Pump 4	
4760	N47:60	44761	R	Auxiliary Analog Input 1 Warning Configuration - Vessel	0 = Disabled 1 = Vessel 1 2 = Vessel 2 3 = Vessel 3
4761	N47:61	44762	R	Auxiliary Analog Input 2 Warning Configuration - Vessel	
4762	N47:62	44763	R	Auxiliary Analog Input 3 Warning Configuration - Vessel	
4763	N47:63	44764	R	Auxiliary Analog Input 4 Warning Configuration - Vessel	
4764	N47:64	44765	R	Auxiliary Analog Input 5 Warning Configuration - Vessel	
4765	N47:65	44766	R	Auxiliary Analog Input 6 Warning Configuration - Vessel	
4766	N47:66	44767	R	Auxiliary Analog Input 7 Warning Configuration - Vessel	
4767	N47:67	44768	R	Auxiliary Analog Input 8 Warning Configuration - Vessel	
4768	N47:68	44769	R	Auxiliary Analog Input 9 Warning Configuration - Vessel	
4769	N47:69	44770	R	Auxiliary Analog Input 10 Warning Configuration - Vessel	
4770	N47:70	44771	R	Auxiliary Analog Input 11 Warning Configuration - Vessel	
4771	N47:71	44772	R	Auxiliary Analog Input 12 Warning Configuration - Vessel	
4780	N47:80	44781	R	Auxiliary Analog Input 1 Warning Configuration - Condenser	0 = Disabled 1 = Enabled
4781	N47:81	44782	R	Auxiliary Analog Input 2 Warning Configuration - Condenser	
4782	N47:82	44783	R	Auxiliary Analog Input 3 Warning Configuration - Condenser	
4783	N47:83	44784	R	Auxiliary Analog Input 4 Warning Configuration - Condenser	
4784	N47:84	44785	R	Auxiliary Analog Input 5 Warning Configuration - Condenser	
4785	N47:85	44786	R	Auxiliary Analog Input 6 Warning Configuration - Condenser	
4786	N47:86	44787	R	Auxiliary Analog Input 7 Warning Configuration - Condenser	
4787	N47:87	44788	R	Auxiliary Analog Input 8 Warning Configuration - Condenser	
4788	N47:88	44789	R	Auxiliary Analog Input 9 Warning Configuration - Condenser	
4789	N47:89	44790	R	Auxiliary Analog Input 10 Warning Configuration - Condenser	
4790	N47:90	44791	R	Auxiliary Analog Input 11 Warning Configuration - Condenser	
4791	N47:91	44792	R	Auxiliary Analog Input 12 Warning Configuration - Condenser	
4792	N47:92	44793	R	Auxiliary Analog Input 13 Warning Configuration - Condenser	
4793	N47:93	44794	R	Auxiliary Analog Input 14 Warning Configuration - Condenser	
4794	N47:94	44795	R	Auxiliary Analog Input 15 Warning Configuration - Condenser	
4795	N47:95	44796	R	Auxiliary Analog Input 16 Warning Configuration - Condenser	
4796	N47:96	44797	R	Auxiliary Analog Input 17 Warning Configuration - Condenser	
4797	N47:97	44798	R	Auxiliary Analog Input 18 Warning Configuration - Condenser	
4798	N47:98	44799	R	Auxiliary Analog Input 19 Warning Configuration - Condenser	
4799	N47:99	44800	R	Auxiliary Analog Input 20 Warning Configuration - Condenser	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4800	N48:00	44801	R	Auxiliary Digital Input 1 Warning Configuration - Vessel	0 = Disabled 1 = Vessel 1 2 = Vessel 2 3 = Vessel 3
4801	N48:01	44802	R	Auxiliary Digital Input 2 Warning Configuration - Vessel	
4802	N48:02	44803	R	Auxiliary Digital Input 3 Warning Configuration - Vessel	
4803	N48:03	44804	R	Auxiliary Digital Input 4 Warning Configuration - Vessel	
4804	N48:04	44805	R	Auxiliary Digital Input 5 Warning Configuration - Vessel	
4805	N48:05	44806	R	Auxiliary Digital Input 6 Warning Configuration - Vessel	
4806	N48:06	44807	R	Auxiliary Digital Input 1 Warning Configuration - Vessel	
4807	N48:07	44808	R	Auxiliary Digital Input 1 Warning Configuration - Vessel	
4808	N48:08	44809	R	Auxiliary Digital Input 1 Warning Configuration - Vessel	
4809	N48:09	44810	R	Auxiliary Digital Input 1 Warning Configuration - Vessel	
4810	N48:10	44811	R	Auxiliary Digital Input 1 Warning Configuration - Vessel	
4820	N48:20	44821	R	Auxiliary Digital Output 1 Configuration - Vessel	0 = Disabled 1 = Vessel 1 2 = Vessel 2 3 = Vessel 3
4821	N48:21	44822	R	Auxiliary Digital Output 2 Configuration - Vessel	
4822	N48:22	44823	R	Auxiliary Digital Output 3 Configuration - Vessel	
4823	N48:23	44824	R	Auxiliary Digital Output 4 Configuration - Vessel	
4824	N48:24	44825	R	Auxiliary Digital Output 5 Configuration - Vessel	
4825	N48:25	44826	R	Auxiliary Digital Output 6 Configuration - Vessel	
4826	N48:26	44827	R	Auxiliary Digital Output 7 Configuration - Vessel	
4827	N48:27	44828	R	Auxiliary Digital Output 8 Configuration - Vessel	
4828	N48:28	44829	R	Auxiliary Digital Output 9 Configuration - Vessel	
4829	N48:29	44830	R	Auxiliary Digital Output 10 Configuration - Vessel	
4830	N48:30	44831	R	Auxiliary Digital Output 11 Configuration - Vessel	
4831	N48:31	44832	R	Auxiliary Digital Output 12 Configuration - Vessel	
4832	N48:32	44833	R	Auxiliary Digital Output 13 Configuration - Vessel	
4833	N48:33	44834	R	Auxiliary Digital Output 14 Configuration - Vessel	
4834	N48:34	44835	R	Auxiliary Digital Output 15 Configuration - Vessel	
4840	N48:40	44841	R	Auxiliary Digital Output 1 Action - Vessel	0 = Greater Than 1 = Less Than
4841	N48:41	44842	R	Auxiliary Digital Output 2 Action - Vessel	
4842	N48:42	44843	R	Auxiliary Digital Output 3 Action - Vessel	
4843	N48:43	44844	R	Auxiliary Digital Output 4 Action - Vessel	
4844	N48:44	44845	R	Auxiliary Digital Output 5 Action - Vessel	
4845	N48:45	44846	R	Auxiliary Digital Output 6 Action - Vessel	
4846	N48:46	44847	R	Auxiliary Digital Output 7 Action - Vessel	
4847	N48:47	44848	R	Auxiliary Digital Output 8 Action - Vessel	
4848	N48:48	44849	R	Auxiliary Digital Output 9 Action - Vessel	
4849	N48:49	44850	R	Auxiliary Digital Output 10 Action - Vessel	
4850	N48:50	44851	R	Auxiliary Digital Output 11 Action - Vessel	
4851	N48:51	44852	R	Auxiliary Digital Output 12 Action - Vessel	
4852	N48:52	44853	R	Auxiliary Digital Output 13 Action - Vessel	
4853	N48:53	44854	R	Auxiliary Digital Output 14 Action - Vessel	
4854	N48:54	44855	R	Auxiliary Digital Output 15 Action - Vessel	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4860	N48:60	44861	R	Auxiliary Digital Output 1 Map Point Vessel	0 = Refrigerant Level 1 = Vessel Pressure 2 = High Side Pressure Pump 1 3 = Low Side Pressure Pump 1 4 = High Side Pressure Pump 2 5 = Low Side Pressure Pump 2 6 = High Side Pressure Pump 3 7 = Low Side Pressure Pump 3 8 = High Side Pressure Pump 4 9 = Low Side Pressure Pump 4 10 = Motor Amps Pump 1 11 = Motor Amps Pump 2 12 = Motor Amps Pump 3 13 = Motor Amps Pump 4 50 = Auxiliary Input 1 - Vessel 51 = Auxiliary Input 2 - Vessel 52 = Auxiliary Input 3 - Vessel 53 = Auxiliary Input 4 - Vessel 54 = Auxiliary Input 5 - Vessel 55 = Auxiliary Input 6 - Vessel 56 = Auxiliary Input 7 - Vessel 57 = Auxiliary Input 8 - Vessel 58 = Auxiliary Input 9 - Vessel 59 = Auxiliary Input 10 - Vessel
4861	N48:61	44862	R	Auxiliary Digital Output 2 Map Point Vessel	
4862	N48:62	44863	R	Auxiliary Digital Output 3 Map Point Vessel	
4863	N48:63	44864	R	Auxiliary Digital Output 4 Map Point Vessel	
4864	N48:64	44865	R	Auxiliary Digital Output 5 Map Point Vessel	
4865	N48:65	44866	R	Auxiliary Digital Output 6 Map Point Vessel	
4866	N48:66	44867	R	Auxiliary Digital Output 7 Map Point Vessel	
4867	N48:67	44868	R	Auxiliary Digital Output 8 Map Point Vessel	
4868	N48:68	44869	R	Auxiliary Digital Output 9 Map Point Vessel	
4869	N48:69	44870	R	Auxiliary Digital Output 10 Map Point Vessel	
4870	N48:70	44871	R	Auxiliary Digital Output 11 Map Point Vessel	
4871	N48:71	44872	R	Auxiliary Digital Output 12 Map Point Vessel	
4872	N48:72	44873	R	Auxiliary Digital Output 13 Map Point Vessel	
4873	N48:73	44874	R	Auxiliary Digital Output 14 Map Point Vessel	
4874	N48:74	44875	R	Auxiliary Digital Output 15 Map Point Vessel	
4880	N48:80	44881	R	Auxiliary Analog Output 1 PI Direction Vessel	0 = Forward 1 = Reverse
4881	N48:81	44882	R	Auxiliary Analog Output 2 PI Direction Vessel	
4882	N48:82	44883	R	Auxiliary Analog Output 3 PI Direction Vessel	
4883	N48:83	44884	R	Auxiliary Analog Output 4 PI Direction Vessel	
4890	N48:90	44891	R	Auxiliary Analog Output 1 Configuration - Vessel	0 = Disabled 1 = Vessel 1 2 = Vessel 2 3 = Vessel 3
4891	N48:91	44892	R	Auxiliary Analog Output 2 Configuration – Vessel	
4892	N48:92	44893	R	Auxiliary Analog Output 3 Configuration – Vessel	
4893	N48:93	44894	R	Auxiliary Analog Output 4 Configuration - Vessel	
4895	N48:95	44896	R	Auxiliary Analog Output 1 Map Point Vessel	0 = Refrigerant Level 1 = Vessel Pressure 2 = High Side Pressure Pump 1 3 = Low Side Pressure Pump 1 4 = High Side Pressure Pump 2 5 = Low Side Pressure Pump 2 6 = High Side Pressure Pump 3 7 = Low Side Pressure Pump 3 8 = High Side Pressure Pump 4 9 = Low Side Pressure Pump 4 10 = Motor Amps Pump 1 11 = Motor Amps Pump 2 12 = Motor Amps Pump 3 13 = Motor Amps Pump 4 50 = Aux. Input 1 - Vessel 51 = Aux. Input 2 - Vessel 52 = Aux. Input 3 - Vessel 53 = Aux. Input 4 - Vessel 54 = Aux. Input 5 - Vessel 55 = Aux. Input 6 - Vessel 56 = Aux. Input 7 - Vessel 57 = Aux. Input 8 - Vessel 58 = Aux. Input 9 - Vessel 59 = Aux. Input 10 - Vessel
4896	N48:96	44897	R	Auxiliary Analog Output 2 Map Point Vessel	
4897	N48:97	44898	R	Auxiliary Analog Output 3 Map Point Vessel	
4898	N48:98	44899	R	Auxiliary Analog Output 4 Map Point Vessel	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4900	N49:00	44901	R	Aux. Digital Input 1 Warning Config. - Condenser	0 = Disabled 1 = Enabled
4901	N49:01	44902	R	Aux. Digital Input 2 Warning Config. - Condenser	
4902	N49:02	44903	R	Aux. Digital Input 3 Warning Config. - Condenser	
4903	N49:03	44904	R	Aux. Digital Input 4 Warning Config. - Condenser	
4904	N49:04	44905	R	Aux. Digital Input 5 Warning Config. - Condenser	
4905	N49:05	44906	R	Aux. Digital Input 6 Warning Config. - Condenser	
4906	N49:06	44907	R	Aux. Digital Input 7 Warning Config. - Condenser	
4907	N49:07	44908	R	Aux. Digital Input 8 Warning Config. - Condenser	
4908	N49:08	44909	R	Aux. Digital Input 9 Warning Config. - Condenser	
4909	N49:09	44910	R	Aux. Digital Input 10 Warning Config. - Condenser	
4910	N49:10	44911	R	Aux. Digital Input 11 Warning Config. - Condenser	
4920	N49:20	44921	R	Aux. Digital Output 1 Config. - Condenser (unit 1)	0 = Disabled 1 = Enabled
4921	N49:21	44922	R	Aux. Digital Output 2 Config. - Condenser (unit 1)	
4922	N49:22	44923	R	Aux. Digital Output 3 Config. - Condenser (unit 1)	
4923	N49:23	44924	R	Aux. Digital Output 4 Config. - Condenser (unit 1)	
4924	N49:24	44925	R	Aux. Digital Output 5 Config. - Condenser (unit 1)	
4925	N49:25	44926	R	Aux. Digital Output 6 Config. - Condenser (unit 1)	
4926	N49:26	44927	R	Aux. Digital Output 7 Config. - Condenser (unit 1)	
4927	N49:27	44928	R	Aux. Digital Output 8 Config. - Condenser (unit 1)	
4928	N49:28	44929	R	Aux. Digital Output 9 Config. - Condenser (unit 1)	
4929	N49:29	44930	R	Aux. Digital Output 10 Config. - Condenser (unit 1)	
4930	N49:30	44931	R	Aux. Digital Output 11 Config. - Condenser (unit 1)	
4940	N49:40	44941	R	Aux. Digital Output 1 Action - Condenser (unit 1)	0 = Greater Than 1 = Less Than
4941	N49:41	44942	R	Aux. Digital Output 2 Action - Condenser (unit 1)	
4942	N49:42	44943	R	Aux. Digital Output 3 Action - Condenser (unit 1)	
4943	N49:43	44944	R	Aux. Digital Output 4 Action - Condenser (unit 1)	
4944	N49:44	44945	R	Aux. Digital Output 5 Action - Condenser (unit 1)	
4945	N49:45	44946	R	Aux. Digital Output 6 Action - Condenser (unit 1)	
4946	N49:46	44947	R	Aux. Digital Output 7 Action - Condenser (unit 1)	
4947	N49:47	44948	R	Aux. Digital Output 8 Action - Condenser (unit 1)	
4948	N49:48	44949	R	Aux. Digital Output 9 Action - Condenser (unit 1)	
4949	N49:49	44950	R	Aux. Digital Output 10 Action - Condenser (unit 1)	
4950	N49:50	44951	R	Aux. Digital Output 11 Action - Condenser (unit 1)	
4960	N49:60	44961	R	Auxiliary Digital Output 1 Map Point Condenser	0 = Pressure - Condenser 1 = Outside Air Temp - Condenser 2 = Outside Air Humidity - Condenser 3 = Drain Temp - Condenser 50 = Aux Input 1 - Condenser 51 = Aux Input 2 - Condenser 52 = Aux_In_3_Cond 53 = Aux_In_4_Cond 54 = Aux_In_5_Cond 55 = Aux_In_6_Cond 56 = Aux_In_7_Cond 57 = Aux_In_8_Cond 58 = Aux_In_9_Cond 59 = Aux_In_10_Cond
4961	N49:61	44962	R	Auxiliary Digital Output 2 Map Point Condenser	
4962	N49:62	44963	R	Auxiliary Digital Output 3 Map Point Condenser	
4963	N49:63	44964	R	Auxiliary Digital Output 4 Map Point Condenser	
4964	N49:64	44965	R	Auxiliary Digital Output 5 Map Point Condenser	
4965	N49:65	44966	R	Auxiliary Digital Output 6 Map Point Condenser	
4966	N49:66	44967	R	Auxiliary Digital Output 7 Map Point Condenser	
4967	N49:67	44968	R	Auxiliary Digital Output 8 Map Point Condenser	
4968	N49:68	44967	R	Auxiliary Digital Output 9 Map Point Condenser	

MODE VALUES:

Frick® Address	AB Address	Modbus Address	Read / Write	Description of Data	Value Codes
4980	N49:80	44981	R	Auxiliary Analog Output 1 PI Direction - Condenser	0 = Forward 1 = Reverse
4981	N49:81	44982	R	Auxiliary Analog Output 2 PI Direction - Condenser	
4982	N49:82	44983	R	Auxiliary Analog Output 3 PI Direction - Condenser	
4983	N49:83	4984	R	Auxiliary Analog Output 4 PI Direction - Condenser	
4990	N49:90	44991	R	Aux. Analog Output 1 Configuration - Condenser	0 = Status Disabled 1 = Status Enabled
4991	N49:91	44992	R	Aux. Analog Output 2 Configuration - Condenser	
4992	N49:92	44993	R	Aux. Analog Output 3 Configuration - Condenser	
4993	N49:93	44994	R	Aux. Analog Output 4 Configuration - Condenser	
4996	N49:96	44997	R	Auxiliary Analog Output 1 Map Point - Condenser	0 = Pressure – Condition 1 = Outside Air Temp - Condenser 2 = Outside Air Humidity - Condenser 3 = Drain Temperature - Condenser 50 = Auxiliary Input 0 - Condenser 51 = Auxiliary Input 1 - Condenser 52 = Auxiliary Input 2 - Condenser 53 = Auxiliary Input 3 - Condenser 54 = Auxiliary Input 4 - Condenser 55 = Auxiliary Input 5 - Condenser 56 = Auxiliary Input 6 - Condenser 57 = Auxiliary Input 7 - Condenser 58 = Auxiliary Input 8 - Condenser 59 = Auxiliary Input 9 - Condenser
4997	N49:97	44998	R	Auxiliary Analog Output 2 Map Point - Condenser	
4998	N49:98	44999	R	Auxiliary Analog Output 3 Map Point - Condenser	
4999	N49:99	45000	R	Auxiliary Analog Output 4 Map Point - Condenser	

TIMER VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data
6050	N60:50	46051	Two-Speed Fan Step 1 - Condenser
6051	N60:51	46052	Two-Speed Fan Step 2 - Condenser
6052	N60:52	46053	Two-Speed Fan Step 3 – Condenser
6053	N60:53	46054	Two-Speed Fan Step 4 – Condenser
6054	N60:54	46055	Two-Speed Fan Step 5 – Condenser
6055	N60:55	46056	Two-Speed Fan Step 6 – Condenser
6056	N60:56	46057	Two-Speed Fan Step 7 – Condenser
6057	N60:57	46058	Two-Speed Fan Step 8 – Condenser
6058	N60:58	46059	Two-Speed Fan Step 9 – Condenser
6059	N60:59	46060	Two-Speed Fan Step 10 – Condenser
6060	N60:60	46061	Two-Speed Fan Step 11 – Condenser
6061	N60:61	46062	Two-Speed Fan Step 12 – Condenser
6062	N60:62	46063	Two-Speed Fan Step 13 – Condenser
6063	N60:63	46064	Two-Speed Fan Step 14 – Condenser
6064	N60:64	46065	Two-Speed Fan Step 15 – Condenser
6065	N60:65	46066	Two-Speed Fan Step 16 – Condenser
6066	N60:66	46067	Two-Speed Fan Step 17 – Condenser
6067	N60:67	46068	Two-Speed Fan Step 18 – Condenser
6068	N60:68	46069	Two-Speed Fan Step 19 – Condenser
6069	N60:69	46070	Two-Speed Fan Step 20 - Condenser
6070	N60:70	46071	Upper Bound Step Timer - Condenser
6071	N60:71	46072	Lower Bound Step Timer - Condenser
6072	N60:72	46073	High Pressure Override Active Timer - Condenser
6073	N60:73	46074	High Pressure Override Safe Timer - Condenser
6074	N60:74	46075	Low Pressure Override Active Timer - Condenser
6075	N60:75	46076	Low Pressure Override Safe Timer - Condenser
6076	N60:76	46077	Low Temperature Override Active Timer - Condenser
6077	N60:77	46078	Low Temperature Override Safe Timer - Condenser
6080	N60:80	46081	Solenoid 1 Off Timer - Vessel 1
6081	N60:81	46082	Solenoid 1 On Timer - Vessel 1
6082	N60:82	46083	Solenoid 2 Off Timer - Vessel 1
6083	N60:83	46084	Solenoid 2 On Timer - Vessel 1
6084	N60:84	46085	Pump Compressor Off Timer - Vessel 1
6085	N60:85	46086	Pump 1 State Time - Vessel 1
6086	N60:86	46087	Pump 2 State Time - Vessel 1
6087	N60:87	46088	Pump 3 State Time - Vessel 1
6088	N60:88	46089	Pump 4 State Time - Vessel 1
6089	N60:89	46090	Pump 1 Total Runtime Timer - Vessel 1
6090	N60:90	46091	Pump 2 Total Runtime Timer - Vessel 1
6091	N60:91	46092	Pump 3 Total Runtime Timer - Vessel 1
6092	N60:92	46093	Pump 4 Total Runtime Timer - Vessel 1
6093	N60:93	46094	Bypass Pump 1 To Open Timer - Vessel 1
6094	N60:94	46095	Bypass Pump 2 To Open Timer - Vessel 1
6095	N60:95	46096	Bypass Pump 3 To Open Timer - Vessel 1
6096	N60:96	46097	Bypass Pump 4 To Open Timer - Vessel 1
6097	N60:97	46098	Bypass Pump 1 To Close Timer - Vessel 1
6098	N60:98	46099	Bypass Pump 2 To Close Timer - Vessel 1

TIMER VALUES: (Read Only)

Frick® Address	AB Address	Modbus Address	Description of Data
6099	N60:99	46100	Bypass Pump 3 To Close Timer - Vessel 1
6100	N60:100	46101	Bypass Pump 4 To Close Timer - Vessel 1
6101	N60:101	46102	Auto Toggle Timer - Vessel 1
6110	N60:110	46111	Solenoid 1 Off Timer - Vessel 2
6111	N60:111	46112	Solenoid 1 On Timer - Vessel 2
6112	N60:112	46113	Solenoid 2 Off Timer - Vessel 2
6113	N60:113	46114	Solenoid 2 On Timer - Vessel 2
6114	N60:114	46115	Pump Compressor Off Timer - Vessel 2
6115	N60:115	46116	Pump 1 State Time - Vessel 2
6116	N60:116	46117	Pump 2 State Time - Vessel 2
6117	N60:117	46118	Pump 3 State Time - Vessel 2
6118	N60:118	46119	Pump 4 State Time - Vessel 2
6119	N60:119	46120	Pump 1 Total Runtime Timer - Vessel 2
6120	N60:120	46121	Pump 2 Total Runtime Timer - Vessel 2
6121	N60:121	46122	Pump 3 Total Runtime Timer - Vessel 2
6122	N60:122	46123	Pump 4 Total Runtime Timer - Vessel 2
6123	N60:123	46124	Bypass Pump 1 To Open Timer - Vessel 2
6124	N60:124	46125	Bypass Pump 2 To Open Timer - Vessel 2
6125	N60:125	46126	Bypass Pump 3 To Open Timer - Vessel 2
6126	N60:126	46127	Bypass Pump 4 To Open Timer - Vessel 2
6127	N60:127	46128	Bypass Pump 1 To Close Timer - Vessel 2
6128	N60:128	46129	Bypass Pump 2 To Close Timer - Vessel 2
6129	N60:129	46130	Bypass Pump 3 To Close Timer - Vessel 2
6130	N60:130	46131	Bypass Pump 4 To Close Timer - Vessel 2
6131	N60:131	46132	Auto Toggle Timer - Vessel 2
6140	N60:140	46141	Solenoid 1 Off Timer - Vessel 3
6141	N60:141	46142	Solenoid 1 On Timer - Vessel 3
6142	N60:142	46143	Solenoid 2 Off Timer - Vessel 3
6143	N60:143	46144	Solenoid 2 On Timer - Vessel 3
6144	N60:144	46145	Pump Compressor Off Timer - Vessel 3
6145	N60:145	46146	Pump 1 State Time - Vessel 3
6146	N60:146	46147	Pump 2 State Time - Vessel 3
6147	N60:147	46148	Pump 3 State Time - Vessel 3
6148	N60:148	46149	Pump 4 State Time - Vessel 3
6149	N60:149	46150	Pump 1 Total Runtime Timer - Vessel 3
6150	N60:150	46151	Pump 2 Total Runtime Timer - Vessel 3
6151	N60:151	46152	Pump 3 Total Runtime Timer - Vessel 3
6152	N60:152	46153	Pump 4 Total Runtime Timer - Vessel 3
6153	N60:153	46154	Bypass Pump 1 To Open Timer - Vessel 3
6154	N60:154	46155	Bypass Pump 2 To Open Timer - Vessel 3
6155	N60:155	46156	Bypass Pump 3 To Open Timer - Vessel 3
6156	N60:156	46157	Bypass Pump 4 To Open Timer - Vessel 3
6157	N60:157	46158	Bypass Pump 1 To Close Timer - Vessel 3
6158	N60:158	46159	Bypass Pump 2 To Close Timer - Vessel 3
6159	N60:159	46160	Bypass Pump 3 To Close Timer - Vessel 3
6160	N60:160	46161	Bypass Pump 4 To Close Timer - Vessel 3
6161	N60:161	46162	Auto Toggle Timer - Vessel 3

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7100	N101:00	47101	Analog Control PI Setpoint - Vessel 1
7101	N101:01	47102	Analog Control PI Setpoint - Vessel 2
7102	N101:02	47103	Analog Control PI Setpoint - Vessel 3
7103	N101:03	47104	Analog Control PI Proportional Band - Vessel 1
7104	N101:04	47105	Analog Control PI Proportional Band - Vessel 2
7105	N101:05	47106	Analog Control PI Proportional Band - Vessel 3
7106	N101:06	47107	Analog Control PI Integration Time - Vessel 1
7107	N101:07	47108	Analog Control PI Integration Time - Vessel 2
7108	N101:08	47109	Analog Control PI Integration Time - Vessel 3
7109	N101:09	47110	Analog Control PI Range Floor - Vessel 1
7110	N101:10	47111	Analog Control PI Range Floor - Vessel 2
7111	N101:11	47112	Analog Control PI Range Floor - Vessel 3
7112	N101:12	47113	Analog Control PI Range Ceiling - Vessel 1
7113	N101:13	47114	Analog Control PI Range Ceiling - Vessel 2
7114	N101:14	47115	Analog Control PI Range Ceiling - Vessel 3
7118	N101:18	47119	Solenoid 1 On Setpoint - Vessel 1
7119	N101:19	47120	Solenoid 1 On Setpoint - Vessel 2
7120	N101:20	47121	Solenoid 1 On Setpoint - Vessel 3
7121	N101:21	47122	Solenoid 1 On Delay - Vessel 1
7122	N101:22	47123	Solenoid 1 On Delay - Vessel 2
7123	N101:23	47124	Solenoid 1 On Delay - Vessel 3
7124	N101:24	47125	Solenoid 1 Off Setpoint - Vessel 1
7125	N101:25	47126	Solenoid 1 Off Setpoint - Vessel 2
7126	N101:26	47127	Solenoid 1 Off Setpoint - Vessel 3
7127	N101:27	47128	Solenoid 1 Off Delay - Vessel 1
7128	N101:28	47129	Solenoid 1 Off Delay - Vessel 2
7129	N101:29	47130	Solenoid 1 Off Delay - Vessel 3
7130	N101:30	47131	Solenoid 2 On Setpoint - Vessel 1
7131	N101:31	47132	Solenoid 2 On Setpoint - Vessel 2
7132	N101:32	47133	Solenoid 2 On Setpoint - Vessel 3
7133	N101:33	47134	Solenoid 2 On Delay - Vessel 1
7134	N101:34	47135	Solenoid 2 On Delay - Vessel 2
7135	N101:35	47136	Solenoid 2 On Delay - Vessel 3
7136	N101:36	47137	Solenoid 2 Off Setpoint - Vessel 1
7137	N101:37	47138	Solenoid 2 Off Setpoint - Vessel 2
7138	N101:38	47139	Solenoid 2 Off Setpoint - Vessel 3
7139	N101:39	47140	Solenoid 2 Off Delay - Vessel 1
7140	N101:40	47141	Solenoid 2 Off Delay - Vessel 2
7141	N101:41	47142	Solenoid 2 Off Delay - Vessel 3
7142	N101:42	47143	Low Level Shutdown Percent - Vessel 1
7143	N101:43	47144	Low Level Shutdown Percent - Vessel 2
7144	N101:44	47145	Low Level Shutdown Percent - Vessel 3
7145	N101:45	47146	Low Level Shutdown Delay - Vessel 1
7146	N101:46	47147	Low Level Shutdown Delay - Vessel 2
7147	N101:47	47148	Low Level Shutdown Delay - Vessel 3
7148	N101:48	47149	Low Level Warning Percent - Vessel 1
7149	N101:49	47150	Low Level Warning Percent - Vessel 2
7150	N101:50	47151	Low Level Warning Percent - Vessel 3

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7151	N101:51	47152	Low Level Warning Delay - Vessel 1
7152	N101:52	47153	Low Level Warning Delay - Vessel 2
7153	N101:53	47154	Low Level Warning Delay - Vessel 3
7157	N101:57	47158	High Level Shutdown Delay - Vessel 1
7158	N101:58	47159	High Level Shutdown Delay - Vessel 2
7159	N101:59	47160	High Level Shutdown Delay - Vessel 3
7160	N101:60	47161	High Level Warning Percent - Vessel 1
7161	N101:61	47162	High Level Warning Percent - Vessel 2
7162	N101:62	47163	High Level Warning Percent - Vessel 3
7163	N101:63	47164	High Level Warning Delay - Vessel 1
7164	N101:64	47165	High Level Warning Delay - Vessel 2
7165	N101:65	47166	High Level Warning Delay - Vessel 3
7166	N101:66	47167	Compressor Run Delay - Vessel 1
7167	N101:67	47168	Compressor Run Delay - Vessel 2
7168	N101:68	47169	Compressor Run Delay - Vessel 3
7169	N101:69	47170	Refrigerant Pump Minimum Pressure Differential Delay - Vessel 1
7170	N101:70	47171	Refrigerant Pump Minimum Pressure Differential Delay - Vessel 2
7171	N101:71	47172	Refrigerant Pump Minimum Pressure Differential Delay - Vessel 3
7172	N101:72	47173	Refrigerant Pump Off Time Delay - Vessel 1
7173	N101:73	47174	Refrigerant Pump Off Time Delay - Vessel 2
7174	N101:74	47175	Refrigerant Pump Off Time Delay - Vessel 3
7175	N101:75	47176	Low Level Shutdown Reset Delay - Vessel 1
7176	N101:76	47177	Low Level Shutdown Reset Delay - Vessel 2
7177	N101:77	47178	Low Level Shutdown Reset Delay - Vessel 3
7178	N101:78	47179	High Level Warning Reset Delay - Vessel 1
7179	N101:79	47180	High Level Warning Reset Delay - Vessel 2
7180	N101:80	47181	High Level Warning Reset Delay - Vessel 3
7193	N101:93	47194	Pump 1 Minimum Differential Pressure - Vessel 1
7194	N101:94	47195	Pump 1 Minimum Differential Pressure - Vessel 2
7195	N101:95	47196	Pump 1 Minimum Differential Pressure - Vessel 3
7196	N101:96	47197	Pump 2 Minimum Differential Pressure - Vessel 1
7197	N101:97	47198	Pump 2 Minimum Differential Pressure - Vessel 2
7198	N101:98	47199	Pump 2 Minimum Differential Pressure - Vessel 3
7199	N101:99	47200	Pump 3 Minimum Differential Pressure - Vessel 1
7200	N102:00	47201	Pump 3 Minimum Differential Pressure - Vessel 2
7201	N102:01	47202	Pump 3 Minimum Differential Pressure - Vessel 3
7202	N102:02	47203	Pump 4 Minimum Differential Pressure - Vessel 1
7203	N102:03	47204	Pump 4 Minimum Differential Pressure - Vessel 2
7204	N102:04	47205	Pump 4 Minimum Differential Pressure - Vessel 3
7205	N102:05	47206	Maximum Pump Shutdowns Per Hour - Vessel 1
7206	N102:06	47207	Maximum Pump Shutdowns Per Hour - Vessel 2
7207	N102:07	47208	Maximum Pump Shutdowns Per Hour - Vessel 3
7208	N102:08	47209	Pump Differential Pressure Shutdown Reset - Vessel 1
7209	N102:09	47210	Pump Differential Pressure Shutdown Reset - Vessel 2
7210	N102:10	47211	Pump Differential Pressure Shutdown Reset - Vessel 3

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7214	N102:14	47215	Refrigerant Pump Auxiliary Failure Delay - Vessel 1
7215	N102:15	47216	Refrigerant Pump Auxiliary Failure Delay - Vessel 2
7216	N102:16	47217	Refrigerant Pump Auxiliary Failure Delay - Vessel 3
7220	N102:20	47221	Total Runtime Pump 1 - Vessel 1
7221	N102:21	47222	Total Runtime Pump 1 - Vessel 2
7222	N102:22	47223	Total Runtime Pump 1 - Vessel 3
7223	N102:23	47224	Total Runtime Pump 2 - Vessel 1
7224	N102:24	47225	Total Runtime Pump 2 - Vessel 2
7225	N102:25	47226	Total Runtime Pump 2 - Vessel 3
7226	N102:26	47227	Total Runtime Pump 3 - Vessel 1
7227	N102:27	47228	Total Runtime Pump 3 - Vessel 2
7228	N102:28	47229	Total Runtime Pump 3 - Vessel 3
7229	N102:29	47230	Total Runtime Pump 4 - Vessel 1
7230	N102:30	47231	Total Runtime Pump 4 - Vessel 2
7231	N102:31	47232	Total Runtime Pump 4 - Vessel 3
7232	N102:32	47233	Auto-Toggle Pumps Interval - Vessel 1
7233	N102:33	47234	Auto-Toggle Pumps Interval - Vessel 2
7234	N102:34	47235	Auto-Toggle Pumps Interval - Vessel 3
7238	N102:38	47239	By-pass Open Differential Pressure Pump 1 - Vessel 1
7239	N102:39	47240	By-pass Open Differential Pressure Pump 1 - Vessel 2
7240	N102:40	47241	By-pass Open Differential Pressure Pump 1 - Vessel 3
7241	N102:41	47242	By-pass Open Differential Pressure Pump 2 - Vessel 1
7242	N102:42	47243	By-pass Open Differential Pressure Pump 2 - Vessel 2
7243	N102:43	47244	By-pass Open Differential Pressure Pump 2 - Vessel 3
7244	N102:44	47245	By-pass Open Differential Pressure Pump 3 - Vessel 1
7245	N102:45	47246	By-pass Open Differential Pressure Pump 3 - Vessel 2
7246	N102:46	47247	By-pass Open Differential Pressure Pump 3 - Vessel 3
7247	N102:47	47248	By-pass Open Differential Pressure Pump 4 - Vessel 1
7248	N102:48	47249	By-pass Open Differential Pressure Pump 4 - Vessel 2
7249	N102:49	47250	By-pass Open Differential Pressure Pump 4 - Vessel 3
7250	N102:50	47251	By-pass Valve Delay - Vessel 1
7251	N102:51	47252	By-pass Valve Delay - Vessel 2
7252	N102:52	47253	By-pass Valve Delay - Vessel 3
7300	N103:00	47301	Step 1 Summer On Sequence Number - Condenser
7301	N103:01	47302	Step 2 Summer On Sequence Number - Condenser
7302	N103:02	47303	Step 3 Summer On Sequence Number - Condenser
7303	N103:03	47304	Step 4 Summer On Sequence Number - Condenser
7304	N103:04	47305	Step 5 Summer On Sequence Number - Condenser
7305	N103:05	47306	Step 6 Summer On Sequence Number - Condenser
7306	N103:06	47307	Step 7 Summer On Sequence Number - Condenser
7307	N103:07	47308	Step 8 Summer On Sequence Number - Condenser
7308	N103:08	47309	Step 9 Summer On Sequence Number - Condenser
7309	N103:09	47310	Step 10 Summer On Sequence Number - Condenser
7310	N103:10	47311	Step 11 Summer On Sequence Number - Condenser
7311	N103:11	47312	Step 12 Summer On Sequence Number - Condenser
7312	N103:12	47313	Step 13 Summer On Sequence Number - Condenser

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7313	N103:13	47314	Step 14 Summer On Sequence Number - Condenser
7314	N103:14	47315	Step 15 Summer On Sequence Number - Condenser
7315	N103:15	47316	Step 16 Summer On Sequence Number - Condenser
7316	N103:16	47317	Step 17 Summer On Sequence Number - Condenser
7317	N103:17	47318	Step 18 Summer On Sequence Number - Condenser
7318	N103:18	47319	Step 19 Summer On Sequence Number - Condenser
7319	N103:19	47320	Step 20 Summer On Sequence Number - Condenser
7320	N103:20	47321	Step 21 Summer On Sequence Number - Condenser
7321	N103:21	47322	Step 22 Summer On Sequence Number - Condenser
7322	N103:22	47323	Step 23 Summer On Sequence Number - Condenser
7323	N103:23	47324	Step 24 Summer On Sequence Number - Condenser
7324	N103:24	47325	Step 1 Summer Off Sequence Number - Condenser
7325	N103:25	47326	Step 2 Summer Off Sequence Number - Condenser
7326	N103:26	47327	Step 3 Summer Off Sequence Number - Condenser
7327	N103:27	47328	Step 4 Summer Off Sequence Number - Condenser
7328	N103:28	47329	Step 5 Summer Off Sequence Number - Condenser
7329	N103:29	47330	Step 6 Summer Off Sequence Number - Condenser
7330	N103:30	47331	Step 7 Summer Off Sequence Number - Condenser
7331	N103:31	47332	Step 8 Summer Off Sequence Number - Condenser
7332	N103:32	47333	Step 9 Summer Off Sequence Number - Condenser
7333	N103:33	47334	Step 10 Summer Off Sequence Number - Condenser
7334	N103:34	47335	Step 11 Summer Off Sequence Number - Condenser
7335	N103:35	47336	Step 12 Summer Off Sequence Number - Condenser
7336	N103:36	47337	Step 13 Summer Off Sequence Number - Condenser
7337	N103:37	47338	Step 14 Summer Off Sequence Number - Condenser
7338	N103:38	47339	Step 15 Summer Off Sequence Number - Condenser
7339	N103:39	47340	Step 16 Summer Off Sequence Number - Condenser
7340	N103:40	47341	Step 17 Summer Off Sequence Number - Condenser
7341	N103:41	47342	Step 18 Summer Off Sequence Number - Condenser
7342	N103:42	47343	Step 19 Summer Off Sequence Number - Condenser
7343	N103:43	47344	Step 20 Summer Off Sequence Number - Condenser
7344	N103:44	47345	Step 21 Summer Off Sequence Number - Condenser
7345	N103:45	47346	Step 22 Summer Off Sequence Number - Condenser
7346	N103:46	47347	Step 23 Summer Off Sequence Number - Condenser
7347	N103:47	47348	Step 24 Summer Off Sequence Number - Condenser
7348	N103:48	47349	Step 1 Winter On Sequence Number - Condenser
7349	N103:49	47350	Step 2 Winter On Sequence Number - Condenser
7350	N103:50	47351	Step 3 Winter On Sequence Number - Condenser
7351	N103:51	47352	Step 4 Winter On Sequence Number - Condenser
7352	N103:52	47353	Step 5 Winter On Sequence Number - Condenser
7353	N103:53	47354	Step 6 Winter On Sequence Number - Condenser
7354	N103:54	47355	Step 7 Winter On Sequence Number - Condenser
7355	N103:55	47356	Step 8 Winter On Sequence Number - Condenser
7356	N103:56	47357	Step 9 Winter On Sequence Number - Condenser
7357	N103:57	47358	Step 10 Winter On Sequence Number - Condenser
7358	N103:58	47359	Step 11 Winter On Sequence Number - Condenser
7359	N103:59	47360	Step 12 Winter On Sequence Number - Condenser
7360	N103:60	47361	Step 13 Winter On Sequence Number - Condenser

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7361	N103:61	47362	Step 14 Winter On Sequence Number - Condenser
7362	N103:62	47363	Step 15 Winter On Sequence Number - Condenser
7363	N103:63	47364	Step 16 Winter On Sequence Number - Condenser
7364	N103:64	47365	Step 17 Winter On Sequence Number - Condenser
7365	N103:65	47366	Step 18 Winter On Sequence Number - Condenser
7366	N103:66	47367	Step 19 Winter On Sequence Number - Condenser
7367	N103:67	47368	Step 20 Winter On Sequence Number - Condenser
7368	N103:68	47369	Step 21 Winter On Sequence Number - Condenser
7369	N103:69	47370	Step 22 Winter On Sequence Number - Condenser
7370	N103:70	47371	Step 23 Winter On Sequence Number - Condenser
7371	N103:71	47372	Step 24 Winter On Sequence Number - Condenser
7372	N103:72	47373	Step 1 Winter Off Sequence Number - Condenser
7373	N103:73	47374	Step 2 Winter Off Sequence Number - Condenser
7374	N103:74	47375	Step 3 Winter Off Sequence Number - Condenser
7375	N103:75	47376	Step 4 Winter Off Sequence Number - Condenser
7376	N103:76	47377	Step 5 Winter Off Sequence Number - Condenser
7377	N103:77	47378	Step 6 Winter Off Sequence Number - Condenser
7378	N103:78	47379	Step 7 Winter Off Sequence Number - Condenser
7379	N103:79	47380	Step 8 Winter Off Sequence Number - Condenser
7380	N103:80	47381	Step 9 Winter Off Sequence Number - Condenser
7381	N103:81	47382	Step 10 Winter Off Sequence Number - Condenser
7382	N103:82	47383	Step 11 Winter Off Sequence Number - Condenser
7383	N103:83	47384	Step 12 Winter Off Sequence Number - Condenser
7384	N103:84	47385	Step 13 Winter Off Sequence Number - Condenser
7385	N103:85	47386	Step 14 Winter Off Sequence Number - Condenser
7386	N103:86	47387	Step 15 Winter Off Sequence Number - Condenser
7387	N103:87	47388	Step 16 Winter Off Sequence Number - Condenser
7388	N103:88	47389	Step 17 Winter Off Sequence Number - Condenser
7389	N103:89	47390	Step 18 Winter Off Sequence Number - Condenser
7390	N103:90	47391	Step 19 Winter Off Sequence Number - Condenser
7391	N103:91	47392	Step 20 Winter Off Sequence Number - Condenser
7392	N103:92	47393	Step 21 Winter Off Sequence Number - Condenser
7393	N103:93	47394	Step 22 Winter Off Sequence Number - Condenser
7394	N103:94	47395	Step 23 Winter Off Sequence Number - Condenser
7395	N103:95	47396	Step 24 Winter Off Sequence Number - Condenser
7400	N104:00	47401	Step 1 Two Speed Fan Delay - Condenser
7401	N104:01	47402	Step 2 Two Speed Fan Delay - Condenser
7402	N104:02	47403	Step 3 Two Speed Fan Delay - Condenser
7403	N104:03	47404	Step 4 Two Speed Fan Delay - Condenser
7404	N104:04	47405	Step 5 Two Speed Fan Delay - Condenser
7405	N104:05	47406	Step 6 Two Speed Fan Delay - Condenser
7406	N104:06	47407	Step 7 Two Speed Fan Delay - Condenser
7407	N104:07	47408	Step 8 Two Speed Fan Delay - Condenser
7408	N104:08	47409	Step 9 Two Speed Fan Delay - Condenser
7409	N104:09	47410	Step 10 Two Speed Fan Delay - Condenser
7410	N104:10	47411	Step 11 Two Speed Fan Delay - Condenser
7411	N104:11	47412	Step 12 Two Speed Fan Delay - Condenser
7412	N104:12	47413	Step 13 Two Speed Fan Delay - Condenser

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7413	N104:13	47414	Step 14 Two Speed Fan Delay - Condenser
7414	N104:14	47415	Step 15 Two Speed Fan Delay - Condenser
7415	N104:15	47416	Step 16 Two Speed Fan Delay - Condenser
7416	N104:16	47417	Step 17 Two Speed Fan Delay - Condenser
7417	N104:17	47418	Step 18 Two Speed Fan Delay - Condenser
7418	N104:18	47419	Step 19 Two Speed Fan Delay - Condenser
7419	N104:19	47420	Step 20 Two Speed Fan Delay - Condenser
7420	N104:20	47421	Step 21 Two Speed Fan Delay - Condenser
7421	N104:21	47422	Step 22 Two Speed Fan Delay - Condenser
7422	N104:22	47423	Step 23 Two Speed Fan Delay - Condenser
7423	N104:23	47424	Step 24 Two Speed Fan Delay - Condenser
7430	N104:30	47431	Summer Mode Temperature
7431	N104:31	47432	Winter Mode Temperature
7440	N104:40	47441	Summer Control Pressure Setpoint - Condenser
7441	N104:41	47442	Summer Control Temperature Setpoint Defrost - Condenser
7442	N104:42	47443	Summer Upper Dead Band - Condenser
7443	N104:43	47444	Summer Lower Dean Band - Condenser
7444	N104:44	47445	Summer Upper Dead Band Delay - Condenser
7445	N104:45	47446	Summer Lower Dead Band Delay - Condenser
7460	N104:60	47461	Winter Control Pressure Setpoint - Condenser
7461	N104:61	47462	Winter Control Pressure Setpoint Defrost - Condenser
7462	N104:62	47463	Winter Upper Dead Band - Condenser
7463	N104:63	47464	Winter Lower Dean Band - Condenser
7464	N104:64	47465	Winter Upper Dead Band Delay - Condenser
7465	N104:65	47466	Winter Lower Dead Band Delay - Condenser
7480	N104:80	47481	High Pressure Warning - Condenser
7481	N104:81	47482	High Pressure Warning Delay - Condenser
7482	N104:82	47483	High Pressure Override - Condenser
7483	N104:83	47484	High Pressure Override Delay - Condenser
7484	N104:84	47485	Low Pressure Override - Condenser
7485	N104:85	47486	Low Pressure Override Delay - Condenser
7491	N104:91	47492	Variable Fan Prop Band - Condenser
7492	N104:92	47493	Variable Fan Integration Time - Condenser
7493	N104:93	47494	Variable Fan Range Floor - Condenser
7494	N104:94	47495	Variable Fan Range Ceiling - Condenser
7495	N104:95	47496	Variable Fan Minimum Speed - Condenser
7500	N105:00	47501	Low Temperature Override - Condenser
7501	N105:01	47502	Low Temperature Override Delay - Condenser
7505	N105:05	47506	Auxiliary Fail Warning Delay
7509	N105:09	47510	Minimum Condensing Pressure (Web Bulb Control)
7510	N105:10	47511	Condensing Temperature Approach (Wet Bulb)

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7515	N105:15	47516	Summer Augmented PI Control Integration Time
7516	N105:16	47517	Winter Augmented PI Control Integration Time
7517	N105:17	47518	Summer Augmented PI Control Proportional Band
7518	N105:18	47519	Winter Augmented PI Control Proportional Band
7600	N106:00	47601	Auxiliary Digital Input 1 Warning Delay - Vessel
7601	N106:01	47602	Auxiliary Digital Input 2 Warning Delay – Vessel
7602	N106:02	47603	Auxiliary Digital Input 3 Warning Delay – Vessel
7603	N106:03	47604	Auxiliary Digital Input 4 Warning Delay – Vessel
7604	N106:04	47605	Auxiliary Digital Input 5 Warning Delay – Vessel
7605	N106:05	47606	Auxiliary Digital Input 6 Warning Delay – Vessel
7606	N106:06	47607	Auxiliary Digital Input 7 Warning Delay – Vessel
7607	N106:07	47608	Auxiliary Digital Input 8 Warning Delay – Vessel
7608	N106:08	47609	Auxiliary Digital Input 9 Warning Delay – Vessel
7609	N106:09	47610	Auxiliary Digital Input 10 Warning Delay – Vessel
7610	N106:10	47611	Auxiliary Digital Input 11 Warning Delay – Vessel
7611	N106:11	47612	Auxiliary Digital Input 12 Warning Delay – Vessel
7612	N106:12	47613	Auxiliary Digital Input 13 Warning Delay – Vessel
7613	N106:13	47614	Auxiliary Digital Input 14 Warning Delay – Vessel
7614	N106:14	47615	Auxiliary Digital Input 15 Warning Delay – Vessel
7615	N106:15	47616	Auxiliary Digital Input 16 Warning Delay – Vessel
7616	N106:16	47617	Auxiliary Digital Input 17 Warning Delay – Vessel
7617	N106:17	47618	Auxiliary Digital Input 18 Warning Delay – Vessel
7620	N106:20	47621	Auxiliary Analog Input 1 Low Warning Setpoint - Vessel
7621	N106:21	47622	Auxiliary Analog Input 2 Low Warning Setpoint - Vessel
7622	N106:22	47623	Auxiliary Analog Input 3 Low Warning Setpoint - Vessel
7623	N106:23	47624	Auxiliary Analog Input 4 Low Warning Setpoint - Vessel
7624	N106:24	47625	Auxiliary Analog Input 5 Low Warning Setpoint - Vessel
7625	N106:25	47626	Auxiliary Analog Input 6 Low Warning Setpoint - Vessel
7626	N106:26	47627	Auxiliary Analog Input 7 Low Warning Setpoint - Vessel
7627	N106:27	47628	Auxiliary Analog Input 8 Low Warning Setpoint - Vessel
7628	N106:28	47629	Auxiliary Analog Input 9 Low Warning Setpoint - Vessel
7629	N106:29	47630	Auxiliary Analog Input 10 Low Warning Setpoint - Vessel
7630	N106:30	47631	Auxiliary Analog Input 11 Low Warning Setpoint - Vessel
7631	N106:31	47632	Auxiliary Analog Input 12 Low Warning Setpoint - Vessel
7640	N106:40	47641	Auxiliary Analog Input 1 Low Warning Delay - Vessel
7641	N106:41	47642	Auxiliary Analog Input 2 Low Warning Delay - Vessel
7642	N106:42	47643	Auxiliary Analog Input 3 Low Warning Delay - Vessel
7643	N106:43	47644	Auxiliary Analog Input 4 Low Warning Delay - Vessel
7644	N106:44	47645	Auxiliary Analog Input 5 Low Warning Delay - Vessel
7645	N106:45	47646	Auxiliary Analog Input 6 Low Warning Delay - Vessel
7646	N106:46	47647	Auxiliary Analog Input 7 Low Warning Delay - Vessel
7647	N106:47	47648	Auxiliary Analog Input 8 Low Warning Delay - Vessel
7648	N106:48	47649	Auxiliary Analog Input 9 Low Warning Delay - Vessel
7649	N106:49	47650	Auxiliary Analog Input 10 Low Warning Delay - Vessel
7650	N106:50	47651	Auxiliary Analog Input 11 Low Warning Delay - Vessel
7651	N106:51	47652	Auxiliary Analog Input 12 Low Warning Delay - Vessel

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7660	N106:60	47661	Auxiliary Analog Input 1 High Warning Setpoint – Vessel
7661	N106:61	47662	Auxiliary Analog Input 2 High Warning Setpoint – Vessel
7662	N106:62	47663	Auxiliary Analog Input 3 High Warning Setpoint – Vessel
7663	N106:63	47664	Auxiliary Analog Input 4 High Warning Setpoint – Vessel
7664	N106:64	47665	Auxiliary Analog Input 5 High Warning Setpoint – Vessel
7665	N106:65	47666	Auxiliary Analog Input 6 High Warning Setpoint – Vessel
7666	N106:66	47667	Auxiliary Analog Input 7 High Warning Setpoint – Vessel
7667	N106:67	47668	Auxiliary Analog Input 7 High Warning Setpoint - Vessel
7668	N106:68	47669	Auxiliary Analog Input 8 High Warning Setpoint - Vessel
7669	N106:69	47670	Auxiliary Analog Input 9 High Warning Setpoint - Vessel
7670	N106:70	47671	Auxiliary Analog Input 10 High Warning Setpoint - Vessel
7671	N106:71	47672	Auxiliary Analog Input 11 High Warning Setpoint - Vessel
7680	N106:80	47681	Auxiliary Analog Input 1 High Warning Delay - Vessel
7681	N106:81	47682	Auxiliary Analog Input 2 High Warning Delay - Vessel
7682	N106:82	47683	Auxiliary Analog Input 3 High Warning Delay - Vessel
7683	N106:83	47684	Auxiliary Analog Input 4 High Warning Delay - Vessel
7684	N106:84	47685	Auxiliary Analog Input 5 High Warning Delay - Vessel
7685	N106:85	47686	Auxiliary Analog Input 6 High Warning Delay - Vessel
7686	N106:86	47687	Auxiliary Analog Input 7 High Warning Delay - Vessel
7687	N106:87	47688	Auxiliary Analog Input 8 High Warning Delay - Vessel
7688	N106:88	47689	Auxiliary Analog Input 9 High Warning Delay - Vessel
7689	N106:89	47690	Auxiliary Analog Input 10 High Warning Delay - Vessel
7690	N106:90	47691	Auxiliary Analog Input 11 High Warning Delay - Vessel
7691	N106:91	47692	Auxiliary Analog Input 12 High Warning Delay - Vessel
7700	N107:00	47701	Auxiliary Digital Output 1 On Setpoint - Vessel
7701	N107:01	47702	Auxiliary Digital Output 2 On Setpoint - Vessel
7702	N107:02	47703	Auxiliary Digital Output 3 On Setpoint - Vessel
7703	N107:03	47704	Auxiliary Digital Output 4 On Setpoint - Vessel
7704	N107:04	47705	Auxiliary Digital Output 5 On Setpoint - Vessel
7705	N107:05	47706	Auxiliary Digital Output 6 On Setpoint - Vessel
7706	N107:06	47707	Auxiliary Digital Output 7 On Setpoint - Vessel
7707	N107:07	47708	Auxiliary Digital Output 8 On Setpoint - Vessel
7708	N107:08	47709	Auxiliary Digital Output 9 On Setpoint - Vessel
7709	N107:09	47710	Auxiliary Digital Output 10 On Setpoint - Vessel
7710	N107:10	47711	Auxiliary Digital Output 11 On Setpoint - Vessel
7711	N107:11	47712	Auxiliary Digital Output 12 On Setpoint - Vessel
7712	N107:12	47713	Auxiliary Digital Output 13 On Setpoint - Vessel
7713	N107:13	47714	Auxiliary Digital Output 14 On Setpoint - Vessel
7714	N107:14	47715	Auxiliary Digital Output 15 On Setpoint - Vessel
7720	N107:20	47721	Auxiliary Digital Output 1 Off Setpoint - Vessel
7721	N107:21	47722	Auxiliary Digital Output 2 Off Setpoint - Vessel
7722	N107:22	47723	Auxiliary Digital Output 3 Off Setpoint - Vessel
7723	N107:23	47724	Auxiliary Digital Output 4 Off Setpoint - Vessel
7724	N107:24	47725	Auxiliary Digital Output 5 Off Setpoint - Vessel
7725	N107:25	47726	Auxiliary Digital Output 6 Off Setpoint - Vessel
7726	N107:26	47727	Auxiliary Digital Output 7 Off Setpoint – Vessel

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
7727	N107:27	47728	Auxiliary Digital Output 8 Off Setpoint - Vessel
7728	N107:28	47729	Auxiliary Digital Output 9 Off Setpoint - Vessel
7729	N107:29	47730	Auxiliary Digital Output 10 Off Setpoint - Vessel
7730	N107:30	47731	Auxiliary Digital Output 11 Off Setpoint - Vessel
7731	N107:31	47732	Auxiliary Digital Output 12 Off Setpoint - Vessel
7732	N107:32	47733	Auxiliary Digital Output 13 Off Setpoint - Vessel
7733	N107:33	47734	Auxiliary Digital Output 14 Off Setpoint - Vessel
7734	N107:34	47735	Auxiliary Digital Output 15 Off Setpoint - Vessel
7740	N107:40	47741	Auxiliary Analog Output 1 Setpoint - Vessel
7741	N107:41	47742	Auxiliary Analog Output 2 Setpoint - Vessel
7742	N107:42	47743	Auxiliary Analog Output 3 Setpoint - Vessel
7743	N107:43	47744	Auxiliary Analog Output 4 Setpoint - Vessel
7750	N107:50	47751	Auxiliary Analog Output 1 Proportional Band - Vessel
7751	N107:51	47752	Auxiliary Analog Output 2 Proportional Band - Vessel
7752	N107:52	47753	Auxiliary Analog Output 3 Proportional Band - Vessel
7753	N107:53	47754	Auxiliary Analog Output 4 Proportional Band - Vessel
7760	N107:60	47761	Auxiliary Analog Output 1 Integration Time - Vessel
7761	N107:61	47762	Auxiliary Analog Output 2 Integration Time - Vessel
7762	N107:62	47763	Auxiliary Analog Output 3 Integration Time - Vessel
7763	N107:63	47764	Auxiliary Analog Output 4 Integration Time - Vessel
7770	N107:70	47771	Auxiliary Analog Output 1 Range Floor - Vessel
7771	N107:71	47772	Auxiliary Analog Output 2 Range Floor - Vessel
7772	N107:72	47773	Auxiliary Analog Output 3 Range Floor - Vessel
7773	N107:73	47774	Auxiliary Analog Output 4 Range Floor - Vessel
7780	N107:80	47781	Auxiliary Analog Output 1 Range Ceiling - Vessel
7781	N107:81	47782	Auxiliary Analog Output 2 Range Ceiling - Vessel
7782	N107:82	47783	Auxiliary Analog Output 3 Range Ceiling - Vessel
7783	N107:83	47784	Auxiliary Analog Output 4 Range Ceiling - Vessel
8200	N112:00	48201	Auxiliary Digital Input 1Warning Delay Condenser
8201	N112:01	48202	Auxiliary Digital Input 2 Warning Delay Condenser
8202	N112:02	48203	Auxiliary Digital Input 3 Warning Delay Condenser
8203	N112:03	48204	Auxiliary Digital Input 4 Warning Delay Condenser
8204	N112:04	48205	Auxiliary Digital Input 5 Warning Delay Condenser
8205	N112:05	48206	Auxiliary Digital Input 6 Warning Delay Condenser
8206	N112:06	48207	Auxiliary Digital Input 7 Warning Delay Condenser
8207	N112:07	48208	Auxiliary Digital Input 8 Warning Delay Condenser
8208	N112:08	48209	Auxiliary Digital Input 9 Warning Delay Condenser
8209	N112:09	48210	Auxiliary Digital Input 10 Warning Delay Condenser
8210	N112:10	48220	Auxiliary Digital Input 11 Warning Delay Condenser
8220	N112:20	48221	Auxiliary Analog Input 1 Low Warning Setpoint - Condenser
8221	N112:21	48222	Auxiliary Analog Input 2 Low Warning Setpoint - Condenser
8222	N112:22	48223	Auxiliary Analog Input 3 Low Warning Setpoint - Condenser
8223	N112:23	48224	Auxiliary Analog Input 4 Low Warning Setpoint - Condenser

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
8224	N112:24	48225	Auxiliary Analog Input 5 Low Warning Setpoint - Condenser
8225	N112:25	48226	Auxiliary Analog Input 6 Low Warning Setpoint - Condenser
8226	N112:26	48227	Auxiliary Analog Input 7 Low Warning Setpoint - Condenser
8227	N112:27	48228	Auxiliary Analog Input 8 Low Warning Setpoint - Condenser
8228	N112:28	48229	Auxiliary Analog Input 9 Low Warning Setpoint - Condenser
8229	N112:29	48230	Auxiliary Analog Input 10 Low Warning Setpoint - Condenser
8230	N112:30	48231	Auxiliary Analog Input 11 Low Warning Setpoint - Condenser
8231	N112:31	48232	Auxiliary Analog Input 12 Low Warning Setpoint - Condenser
8232	N112:32	48233	Auxiliary Analog Input 13 Low Warning Setpoint - Condenser
8233	N112:33	48234	Auxiliary Analog Input 14 Low Warning Setpoint - Condenser
8234	N112:34	48235	Auxiliary Analog Input 15 Low Warning Setpoint - Condenser
8235	N112:35	48236	Auxiliary Analog Input 16 Low Warning Setpoint - Condenser
8236	N112:36	48237	Auxiliary Analog Input 17 Low Warning Setpoint - Condenser
8237	N112:37	48238	Auxiliary Analog Input 18 Low Warning Setpoint - Condenser
8238	N112:38	48239	Auxiliary Analog Input 19 Low Warning Setpoint - Condenser
8239	N112:39	48240	Auxiliary Analog Input 20 Low Warning Setpoint - Condenser
8240	N112:40	48241	Auxiliary Analog Input 1 Low Warning Delay - Condenser
8241	N112:41	48242	Auxiliary Analog Input 2 Low Warning Delay - Condenser
8242	N112:42	48243	Auxiliary Analog Input 3 Low Warning Delay - Condenser
8243	N112:43	48244	Auxiliary Analog Input 4 Low Warning Delay - Condenser
8244	N112:44	48245	Auxiliary Analog Input 5 Low Warning Delay - Condenser
8245	N112:45	48246	Auxiliary Analog Input 6 Low Warning Delay - Condenser
8246	N112:46	48247	Auxiliary Analog Input 7 Low Warning Delay - Condenser
8247	N112:47	48248	Auxiliary Analog Input 8 Low Warning Delay - Condenser
8248	N112:48	48249	Auxiliary Analog Input 9 Low Warning Delay - Condenser
8249	N112:49	48250	Auxiliary Analog Input 10 Low Warning Delay - Condenser
8250	N112:50	48251	Auxiliary Analog Input 11 Low Warning Delay - Condenser
8251	N112:51	48252	Auxiliary Analog Input 12 Low Warning Delay - Condenser
8252	N112:52	48253	Auxiliary Analog Input 13 Low Warning Delay - Condenser
8253	N112:53	48254	Auxiliary Analog Input 14 Low Warning Delay - Condenser
8254	N112:54	48255	Auxiliary Analog Input 15 Low Warning Delay - Condenser
8255	N112:55	48256	Auxiliary Analog Input 16 Low Warning Delay - Condenser
8256	N112:56	48257	Auxiliary Analog Input 17 Low Warning Delay - Condenser
8257	N112:57	48258	Auxiliary Analog Input 18 Low Warning Delay - Condenser
8258	N112:58	48259	Auxiliary Analog Input 19 Low Warning Delay - Condenser
8259	N112:59	48260	Auxiliary Analog Input 20 Low Warning Delay - Condenser
8260	N112:60	48261	Auxiliary Analog Input 1 High Warning Setpoint - Condenser
8261	N112:61	48262	Auxiliary Analog Input 2 High Warning Setpoint - Condenser
8262	N112:62	48263	Auxiliary Analog Input 3 High Warning Setpoint - Condenser
8263	N112:63	48264	Auxiliary Analog Input 4 High Warning Setpoint - Condenser
8264	N112:64	48265	Auxiliary Analog Input 5 High Warning Setpoint - Condenser
8265	N112:65	48266	Auxiliary Analog Input 6 High Warning Setpoint - Condenser
8266	N112:66	48267	Auxiliary Analog Input 7 High Warning Setpoint - Condenser
8267	N112:67	48268	Auxiliary Analog Input 8 High Warning Setpoint - Condenser
8268	N112:68	48269	Auxiliary Analog Input 9 High Warning Setpoint - Condenser
8269	N112:69	48270	Auxiliary Analog Input 10 High Warning Setpoint - Condenser
8270	N112:70	48271	Auxiliary Analog Input 11 High Warning Setpoint - Condenser
8271	N112:71	48272	Auxiliary Analog Input 12 High Warning Setpoint - Condenser

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
8272	N112:72	48273	Auxiliary Analog Input 13 High Warning Setpoint - Condenser
8273	N112:73	48274	Auxiliary Analog Input 14 High Warning Setpoint - Condenser
8274	N112:74	48275	Auxiliary Analog Input 15 High Warning Setpoint - Condenser
8275	N112:75	48276	Auxiliary Analog Input 16 High Warning Setpoint - Condenser
8276	N112:76	48277	Auxiliary Analog Input 17 High Warning Setpoint - Condenser
8277	N112:77	48278	Auxiliary Analog Input 18 High Warning Setpoint - Condenser
8278	N112:78	48279	Auxiliary Analog Input 19 High Warning Setpoint - Condenser
8279	N112:79	48280	Auxiliary Analog Input 20 High Warning Setpoint - Condenser
8280	N112:80	48281	Auxiliary Analog Input 1 High Warning Delay - Condenser
8281	N112:81	48282	Auxiliary Analog Input 2 High Warning Delay - Condenser
8282	N112:82	48283	Auxiliary Analog Input 3 High Warning Delay - Condenser
8283	N112:83	48284	Auxiliary Analog Input 4 High Warning Delay - Condenser
8284	N112:84	48285	Auxiliary Analog Input 5 High Warning Delay - Condenser
8285	N112:85	48286	Auxiliary Analog Input 6 High Warning Delay - Condenser
8286	N112:86	48287	Auxiliary Analog Input 7 High Warning Delay - Condenser
8287	N112:87	48288	Auxiliary Analog Input 8 High Warning Delay - Condenser
8288	N112:88	48289	Auxiliary Analog Input 9 High Warning Delay - Condenser
8289	N112:89	48290	Auxiliary Analog Input 10 High Warning Delay - Condenser
8290	N112:90	48291	Auxiliary Analog Input 11 High Warning Delay - Condenser
8291	N112:91	48292	Auxiliary Analog Input 12 High Warning Delay - Condenser
8292	N112:92	48293	Auxiliary Analog Input 13 High Warning Delay - Condenser
8293	N112:93	48294	Auxiliary Analog Input 14 High Warning Delay - Condenser
8294	N112:94	48295	Auxiliary Analog Input 15 High Warning Delay - Condenser
8295	N112:95	48296	Auxiliary Analog Input 16 High Warning Delay - Condenser
8296	N112:96	48297	Auxiliary Analog Input 17 High Warning Delay - Condenser
8297	N112:97	48298	Auxiliary Analog Input 18 High Warning Delay - Condenser
8298	N112:98	48299	Auxiliary Analog Input 19 High Warning Delay - Condenser
8299	N112:99	48300	Auxiliary Analog Input 20 High Warning Delay - Condenser
8300	N113:00	48301	Auxiliary Digital Output 1 On Setpoint - Condenser
8301	N113:01	48302	Auxiliary Digital Output 2 On Setpoint - Condenser
8302	N113:02	48303	Auxiliary Digital Output 3 On Setpoint - Condenser
8303	N113:03	48304	Auxiliary Digital Output 4 On Setpoint - Condenser
8304	N113:04	48305	Auxiliary Digital Output 5 On Setpoint - Condenser
8305	N113:05	48306	Auxiliary Digital Output 6 On Setpoint - Condenser
8306	N113:06	48307	Auxiliary Digital Output 7 On Setpoint - Condenser
8307	N113:07	48308	Auxiliary Digital Output 8 On Setpoint - Condenser
8308	N113:08	48309	Auxiliary Digital Output 9 On Setpoint - Condenser
8309	N113:09	48310	Auxiliary Digital Output 10 On Setpoint - Condenser
8310	N113:10	48311	Auxiliary Digital Output 11 On Setpoint - Condenser
8320	N113:20	48321	Auxiliary Digital Output 1 Off Setpoint - Condenser
8321	N113:21	48322	Auxiliary Digital Output 2 Off Setpoint - Condenser
8322	N113:22	48323	Auxiliary Digital Output 3 Off Setpoint - Condenser
8323	N113:23	48324	Auxiliary Digital Output 4 Off Setpoint - Condenser
8324	N113:24	48325	Auxiliary Digital Output 5 Off Setpoint - Condenser
8325	N113:25	48326	Auxiliary Digital Output 6 Off Setpoint - Condenser
8326	N113:26	48327	Auxiliary Digital Output 7 Off Setpoint - Condenser
8327	N113:27	48328	Auxiliary Digital Output 8 Off Setpoint - Condenser

SETPOINT VALUES:

Frick® Address	AB Address	Modbus Address	Description of Data
8328	N113:28	48329	Auxiliary Digital Output 9 Off Setpoint - Condenser
8329	N113:29	48330	Auxiliary Digital Output 10 Off Setpoint - Condenser
8330	N113:30	48331	Auxiliary Digital Output 11 Off Setpoint - Condenser
8340	N113:40	48341	Auxiliary Analog Output 1 Setpoint - Condenser
8341	N113:41	48342	Auxiliary Analog Output 2 Setpoint - Condenser
8342	N113:42	48343	Auxiliary Analog Output 3 Setpoint - Condenser
8343	N113:43	48344	Auxiliary Analog Output 4 Setpoint - Condenser
8344	N113:44	48345	Auxiliary Analog Output 5 Setpoint - Condenser
8350	N113:50	48351	Auxiliary Analog Output 1 Proportional Band - Condenser
8351	N113:51	48352	Auxiliary Analog Output 2 Proportional Band - Condenser
8352	N113:52	48353	Auxiliary Analog Output 3 Proportional Band - Condenser
8353	N113:53	48354	Auxiliary Analog Output 4 Proportional Band - Condenser
8354	N113:54	48355	Auxiliary Analog Output 5 Proportional Band - Condenser
8360	N113:60	48361	Auxiliary Analog Output 1 Integration Time - Condenser
8361	N113:61	48362	Auxiliary Analog Output 2 Integration Time - Condenser
8362	N113:62	48363	Auxiliary Analog Output 3 Integration Time - Condenser
8363	N113:63	48364	Auxiliary Analog Output 4 Integration Time - Condenser
8364	N113:64	48365	Auxiliary Analog Output 5 Integration Time - Condenser
8370	N113:70	48371	Auxiliary Analog Output 1 Range Floor - Condenser
8371	N113:71	48372	Auxiliary Analog Output 2 Range Floor - Condenser
8372	N113:72	48373	Auxiliary Analog Output 3 Range Floor - Condenser
8373	N113:73	48374	Auxiliary Analog Output 4 Range Floor - Condenser
8374	N113:74	48375	Auxiliary Analog Output 5 Range Floor - Condenser
8380	N113:80	48381	Auxiliary Analog Output 1 Range Ceiling - Condenser
8381	N113:81	48382	Auxiliary Analog Output 2 Range Ceiling - Condenser
8382	N113:82	48383	Auxiliary Analog Output 3 Range Ceiling - Condenser
8383	N113:83	48384	Auxiliary Analog Output 4 Range Ceiling - Condenser
8384	N113:84	48385	Auxiliary Analog Output 5 Range Ceiling - Condenser

COMMANDS:

Frick® Address	AB Address	Modbus Address	Read/Write	Description of Data	Value Codes
4050	N40:50	44051	W	Clear Safeties - Condenser	1 = Clear Safeties
4051	N40:51	44052	W	Clear Safeties – Vessel 1	
4052	N40:52	44053	W	Clear Safeties – Vessel 2	
4053	N40:53	44054	W	Clear Safeties – Vessel 3	
4054	N40:54	44055	W	Clear Safeties History - Condenser	1 = Clear History
4055	N40:55	44056	W	Clear Safeties History – Vessel 1	
4056	N40:56	44057	W	Clear Safeties History – Vessel 2	
4057	N40:57	44058	W	Clear Safeties History – Vessel 3	
4566	N45:66	44567	R/W	Panel Communications Units	0 = Celsius, PSIA 1 = Panel Units

GENERAL NOTES:

- Command Values need tenths field added. For example, to clear the safeties for the Condenser, the table above states that 1 = Clear Safeties. However, being that one decimal place is assumed, a value of 10 actually needs to be sent using Frick address 4050.

WARNING/SHUTDOWN MESSAGE CODES

10 Process Stopped - Condenser
11 Process Stopped - Vessel 1
12 Process Stopped - Vessel 2
13 Process Stopped - Vessel 3
17 Analog Board 2 Communications Shutdown - Vessel 1
18 Analog Board 2 Communications Shutdown -Vessel 2
19 Analog Board 2 Communications Shutdown - Vessel 3
20 Analog Board 3 Communications Shutdown - Vessel 1
21 Analog Board 3 Communications Shutdown - Vessel 2
22 Analog Board 3 Communications Shutdown - Vessel 3
23 Digital Board 4 Communications Shutdown - Vessel 1
24 Digital Board 4 Communications Shutdown - Vessel 2
25 Digital Board 4 Communications Shutdown - Vessel 3
26 Digital Board 5 Communications Shutdown - Vessel 1
27 Digital Board 5 Communications Shutdown - Vessel 2
28 Digital Board 5 Communications Shutdown - Vessel 3
29 Digital Board 6 Communications Shutdown - Vessel 1
30 Digital Board 6 Communications Shutdown - Vessel 2
31 Digital Board 6 Communications Shutdown - Vessel 3
32 Digital Board 4 Reset Shutdown - Vessel 1
33 Digital Board 4 Reset Shutdown - Vessel 2
34 Digital Board 4 Reset Shutdown - Vessel 3
35 Digital Board 5 Reset Shutdown - Vessel 1
36 Digital Board 5 Reset Shutdown - Vessel 2
37 Digital Board 5 Reset Shutdown - Vessel 3
38 Digital Board 6 Reset Shutdown - Vessel 1
39 Digital Board 6 Reset Shutdown - Vessel 2
40 Digital Board 6 Reset Shutdown - Vessel 3
50 Analog Board 1 Comm. Shutdown - Condenser
51 Digital Board 1 Comm. Shutdown - Condenser
52 Digital Board 2 Comm. Shutdown - Condenser
53 Digital Board 3 Comm. Shutdown - Condenser
54 Digital Board 1 Reset Shutdown - Condenser
55 Digital Board 2 Reset Shutdown - Condenser
56 Digital Board 3 Reset Shutdown - Condenser
60 Refrigerant Level Sensor Fault - Vessel 1
61 Refrigerant Level Sensor Fault - Vessel 2
62 Refrigerant Level Sensor Fault - Vessel 3
63 Vessel Pressure Sensor Fault - Vessel 1
64 Vessel Pressure Sensor Fault - Vessel 2
65 Vessel Pressure Sensor Fault - Vessel 3
69 High Level Warning (Digital) - Vessel 1
70 High Level Warning (Digital) - Vessel 2
71 High Level Warning (Digital) - Vessel 3
72 High Level Shutdown (Digital) - Vessel 1
73 High Level Shutdown (Digital) - Vessel 2
74 High Level Shutdown (Digital) - Vessel 3
75 Low Level Warning (Digital) - Vessel 1
76 Low Level Warning (Digital) - Vessel 2
77 Low Level Warning (Digital) - Vessel 3
78 Low Level Shutdown (Digital) - Vessel 1
79 Low Level Shutdown (Digital) - Vessel 2
80 Low Level Shutdown (Digital) - Vessel 3
81 High Level Warning (Analog) - Vessel 1
82 High Level Warning (Analog) - Vessel 2
83 High Level Warning (Analog) - Vessel 3
84 Low Level Shutdown (Analog) - Vessel 1
85 Low Level Shutdown (Analog) - Vessel 2
86 Low Level Shutdown (Analog) - Vessel 3
87 Low Level Warning (Analog) - Vessel 1
88 Low Level Warning (Analog) - Vessel 2
89 Low Level Warning (Analog) - Vessel 3
93 Pump 1 Pressure Differential - Vessel 1
94 Pump 1 Pressure Differential - Vessel 2
95 Pump 1 Pressure Differential - Vessel 3
96 Pump 2 Pressure Differential - Vessel 1
97 Pump 2 Pressure Differential - Vessel 2
98 Pump 2 Pressure Differential - Vessel 3
99 Pump 3 Pressure Differential - Vessel 1
100 Pump 3 Pressure Differential - Vessel 2
101 Pump 3 Pressure Differential - Vessel 3
102 Pump 4 Pressure Differential - Vessel 1
103 Pump 4 Pressure Differential - Vessel 2
104 Pump 4 Pressure Differential - Vessel 3
110 Auxiliary Digital Input 1 Warning - Vessel
111 Auxiliary Digital Input 2 Warning - Vessel
112 Auxiliary Digital Input 3 Warning - Vessel
113 Auxiliary Digital Input 4 Warning - Vessel
114 Auxiliary Digital Input 5 Warning - Vessel
115 Auxiliary Digital Input 6 Warning - Vessel
116 Auxiliary Digital Input 7 Warning - Vessel
117 Auxiliary Digital Input 8 Warning - Vessel
118 Auxiliary Digital Input 9 Warning – Vessel
119 Auxiliary Digital Input 10 Warning - Vessel
120 Auxiliary Digital Input 11 Warning - Vessel
121 Auxiliary Digital Input 12 Warning - Vessel
122 Auxiliary Digital Input 13 Warning - Vessel
123 Auxiliary Digital Input 14 Warning - Vessel
124 Auxiliary Digital Input 15 Warning - Vessel
125 Auxiliary Digital Input 16 Warning - Vessel
126 Auxiliary Digital Input 17 Warning - Vessel
127 Auxiliary Digital Input 18 Warning - Vessel
130 Auxiliary Analog Input 1 Low Warning - Vessel
131 Auxiliary Analog Input 2 Low Warning - Vessel
132 Auxiliary Analog Input 3 Low Warning - Vessel
133 Auxiliary Analog Input 4 Low Warning - Vessel
134 Auxiliary Analog Input 5 Low Warning - Vessel
135 Auxiliary Analog Input 6 Low Warning - Vessel
136 Auxiliary Analog Input 7 Low Warning - Vessel
137 Auxiliary Analog Input 8 Low Warning - Vessel
138 Auxiliary Analog Input 9 Low Warning - Vessel
139 Auxiliary Analog Input 10 Low Warning - Vessel
140 Auxiliary Analog Input 11 Low Warning - Vessel
141 Auxiliary Analog Input 12 Low Warning - Vessel
150 Auxiliary Analog Input 1 High Warning - Vessel
151 Auxiliary Analog Input 2 High Warning - Vessel
152 Auxiliary Analog Input 3 High Warning - Vessel
153 Auxiliary Analog Input 4 High Warning - Vessel
154 Auxiliary Analog Input 5 High Warning - Vessel
155 Auxiliary Analog Input 6 High Warning - Vessel
156 Auxiliary Analog Input 7 High Warning - Vessel
157 Auxiliary Analog Input 8 High Warning - Vessel
158 Auxiliary Analog Input 9 High Warning - Vessel
159 Auxiliary Analog Input 10 High Warning - Vessel
160 Auxiliary Analog Input 11 High Warning - Vessel
161 Auxiliary Analog Input 12 High Warning - Vessel
170 Refrigerant Pump 1 Auxiliary Shutdown - Vessel 1
171 Refrigerant Pump 1 Auxiliary Shutdown - Vessel 2

172 Refrigerant Pump 1 Auxiliary Shutdown - Vessel 3
173 Refrigerant Pump 2 Auxiliary Shutdown - Vessel 1
174 Refrigerant Pump 2 Auxiliary Shutdown - Vessel 2
175 Refrigerant Pump 2 Auxiliary Shutdown - Vessel 3
176 Refrigerant Pump 3 Auxiliary Shutdown - Vessel 1
177 Refrigerant Pump 3 Auxiliary Shutdown - Vessel 2
178 Refrigerant Pump 3 Auxiliary Shutdown - Vessel 3
179 Refrigerant Pump 4 Auxiliary Shutdown - Vessel 1
180 Refrigerant Pump 4 Auxiliary Shutdown - Vessel 2
181 Refrigerant Pump 4 Auxiliary Shutdown - Vessel 3
182 Refrigerant Pump 1 Motor Amps Shutdown - Vessel 1
183 Refrigerant Pump 1 Motor Amps Shutdown - Vessel 2
184 Refrigerant Pump 1 Motor Amps Shutdown - Vessel 3
185 Refrigerant Pump 2 Motor Amps Shutdown - Vessel 1
186 Refrigerant Pump 2 Motor Amps Shutdown - Vessel 2
187 Refrigerant Pump 2 Motor Amps Shutdown - Vessel 3
188 Refrigerant Pump 3 Motor Amps Shutdown - Vessel 1
189 Refrigerant Pump 3 Motor Amps Shutdown - Vessel 2
190 Refrigerant Pump 3 Motor Amps Shutdown - Vessel 3
191 Refrigerant Pump 4 Motor Amps Shutdown - Vessel 1
192 Refrigerant Pump 4 Motor Amps Shutdown - Vessel 2
193 Refrigerant Pump 4 Motor Amps Shutdown - Vessel 3
200 Pressure Sensor Fault - Condenser
201 Outside Air Temperature Sensor Fault - Condenser
202 Outside Humidity Sensor Fault - Condenser
203 Drain Sensor Fault - Condenser
204 High Pressure Warning - Condenser
220 Step 1 Aux Fail Warning - Condenser
221 Step 2 Aux Fail Warning - Condenser
222 Step 3 Aux Fail Warning - Condenser
223 Step 4 Aux Fail Warning - Condenser
224 Step 5 Aux Fail Warning - Condenser
225 Step 6 Aux Fail Warning - Condenser
226 Step 7 Aux Fail Warning - Condenser
227 Step 8 Aux Fail Warning - Condenser
228 Step 9 Aux Fail Warning - Condenser
229 Step 10 Aux Fail Warning - Condenser
230 Step 11 Aux Fail Warning - Condenser
231 Step 12 Aux Fail Warning - Condenser
232 Step 13 Aux Fail Warning - Condenser
233 Step 14 Aux Fail Warning - Condenser
234 Step 15 Aux Fail Warning - Condenser
235 Step 16 Aux Fail Warning - Condenser
236 Step 17 Aux Fail Warning - Condenser
237 Step 18 Aux Fail Warning - Condenser
238 Step 19 Aux Fail Warning - Condenser
239 Step 20 Aux Fail Warning - Condenser
240 Step 21 Aux Fail Warning - Condenser
241 Step 22 Aux Fail Warning - Condenser
242 Step 23 Aux Fail Warning - Condenser
243 Step 24 Aux Fail Warning - Condenser
250 Auxiliary Digital Input 1 Warning - Condenser
251 Auxiliary Digital Input 2 Warning - Condenser
252 Auxiliary Digital Input 3 Warning - Condenser
253 Auxiliary Digital Input 4 Warning - Condenser
254 Auxiliary Digital Input 5 Warning - Condenser
255 Auxiliary Digital Input 6 Warning - Condenser
256 Auxiliary Digital Input 7 Warning - Condenser
257 Auxiliary Digital Input 8 Warning - Condenser
258 Auxiliary Digital Input 9 Warning - Condenser
259 Auxiliary Digital Input 10 Warning - Condenser
260 Auxiliary Digital Input 11 Warning - Condenser
270 Auxiliary Analog Input 1 Low Warning - Condenser
271 Auxiliary Analog Input 2 Low Warning - Condenser
272 Auxiliary Analog Input 3 Low Warning - Condenser
273 Auxiliary Analog Input 4 Low Warning - Condenser
274 Auxiliary Analog Input 5 Low Warning - Condenser
275 Auxiliary Analog Input 6 Low Warning - Condenser
276 Auxiliary Analog Input 7 Low Warning - Condenser
277 Auxiliary Analog Input 8 Low Warning - Condenser
278 Auxiliary Analog Input 9 Low Warning - Condenser
279 Auxiliary Analog Input 10 Low Warning - Condenser
280 Auxiliary Analog Input 11 Low Warning - Condenser
281 Auxiliary Analog Input 12 Low Warning - Condenser
282 Auxiliary Analog Input 13 Low Warning - Condenser
283 Auxiliary Analog Input 14 Low Warning - Condenser
284 Auxiliary Analog Input 15 Low Warning - Condenser
285 Auxiliary Analog Input 16 Low Warning - Condenser
286 Auxiliary Analog Input 17 Low Warning - Condenser
287 Auxiliary Analog Input 18 Low Warning - Condenser
288 Auxiliary Analog Input 19 Low Warning - Condenser
289 Auxiliary Analog Input 20 Low Warning - Condenser
290 Auxiliary Analog Input 1 High Warning - Condenser
291 Auxiliary Analog Input 2 High Warning - Condenser
292 Auxiliary Analog Input 3 High Warning - Condenser
293 Auxiliary Analog Input 4 High Warning - Condenser
294 Auxiliary Analog Input 5 High Warning - Condenser
295 Auxiliary Analog Input 6 High Warning - Condenser
296 Auxiliary Analog Input 7 High Warning - Condenser
297 Auxiliary Analog Input 8 High Warning - Condenser
298 Auxiliary Analog Input 9 High Warning - Condenser
299 Auxiliary Analog Input 10 High Warning - Condenser
300 Auxiliary Analog Input 11 High Warning - Condenser
301 Auxiliary Analog Input 12 High Warning - Condenser
302 Auxiliary Analog Input 13 High Warning - Condenser
303 Auxiliary Analog Input 14 High Warning - Condenser
304 Auxiliary Analog Input 15 High Warning - Condenser
305 Auxiliary Analog Input 16 High Warning - Condenser
306 Auxiliary Analog Input 17 High Warning - Condenser
307 Auxiliary Analog Input 18 High Warning - Condenser
308 Auxiliary Analog Input 19 High Warning - Condenser
309 Auxiliary Analog Input 20 High Warning - Condenser
400 Pump 1 High Side Pressure Sensor Fault - Vessel 1
401 Pump 1 High Side Pressure Sensor Fault - Vessel 2
402 Pump 1 High Side Pressure Sensor Fault - Vessel 3
403 Pump 2 High Side Pressure Sensor Fault - Vessel 1
404 Pump 2 High Side Pressure Sensor Fault - Vessel 2
405 Pump 2 High Side Pressure Sensor Fault - Vessel 3
406 Pump 3 High Side Pressure Sensor Fault - Vessel 1
407 Pump 3 High Side Pressure Sensor Fault - Vessel 2
408 Pump 3 High Side Pressure Sensor Fault - Vessel 3
409 Pump 4 High Side Pressure Sensor Fault - Vessel 1
410 Pump 4 High Side Pressure Sensor Fault - Vessel 2
411 Pump 4 High Side Pressure Sensor Fault - Vessel 3
420 Pump 1 Low Side Pressure Sensor Fault - Vessel 1
421 Pump 1 Low Side Pressure Sensor Fault - Vessel 2
422 Pump 1 Low Side Pressure Sensor Fault - Vessel 3
423 Pump 2 Low Side Pressure Sensor Fault - Vessel 1
424 Pump 2 Low Side Pressure Sensor Fault - Vessel 2
425 Pump 2 Low Side Pressure Sensor Fault - Vessel 3
426 Pump 3 Low Side Pressure Sensor Fault - Vessel 1
427 Pump 3 Low Side Pressure Sensor Fault - Vessel 2
428 Pump 3 Low Side Pressure Sensor Fault - Vessel 3
429 Pump 4 Low Side Pressure Sensor Fault - Vessel 1

430 Pump 4 Low Side Pressure Sensor Fault - Vessel 2
431 Pump 4 Low Side Pressure Sensor Fault - Vessel 3
440 Pump 1 Motor Amps Sensor Fault - Vessel 1
441 Pump 1 Motor Amps Sensor Fault - Vessel 2
442 Pump 1 Motor Amps Sensor Fault - Vessel 3
443 Pump 2 Motor Amps Sensor Fault - Vessel 1
444 Pump 2 Motor Amps Sensor Fault - Vessel 2
445 Pump 2 Motor Amps Sensor Fault - Vessel 3
446 Pump 3 Motor Amps Sensor Fault - Vessel 1
447 Pump 3 Motor Amps Sensor Fault - Vessel 2
448 Pump 3 Motor Amps Sensor Fault - Vessel 3
449 Pump 4 Motor Amps Sensor Fault - Vessel 1
450 Pump 4 Motor Amps Sensor Fault - Vessel 2
451 Pump 4 Motor Amps Sensor Fault - Vessel 3

QUANTUM™ 4 MAIN BOARD HISTORY AND IDENTIFICATION

The processor board shown on this page is known as the Quantum™ 4 board, and it is based on the Pentium microprocessor platform. The operating software that this board runs is known as Quantum™ LX software.

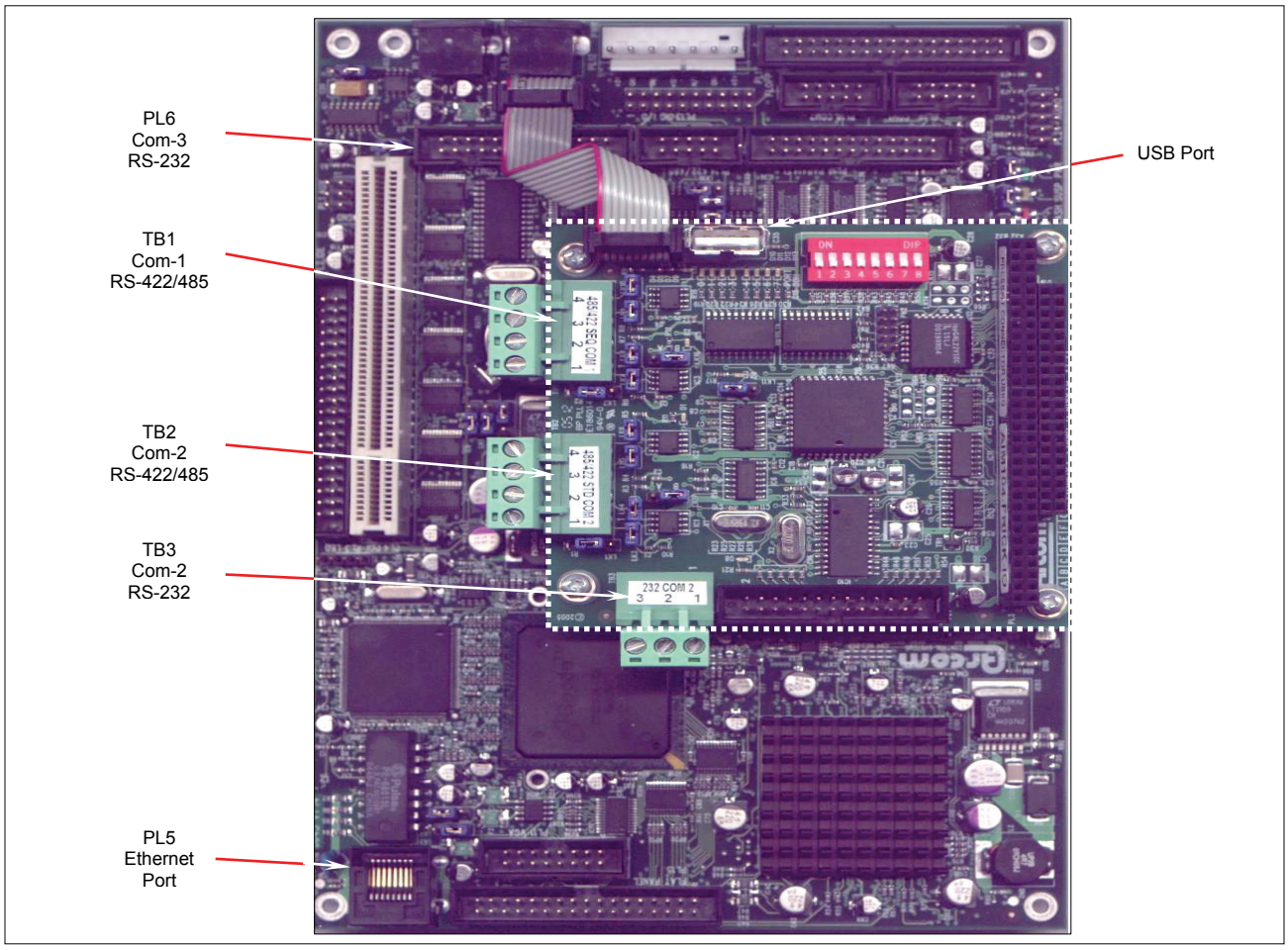
The Quantum™ 4 board can be identified by the presence of a daughter board mounted to the main board. This *daughter board* is the communications portion of the Quantum™ 4, and it can be identified by the presence of an 8 position DIP switch. There are also a number of jumpers (or links) present on this smaller board, as well as three green connectors (RS-232, RS-422 and RS-485 ports). The jumpers are used to set up the communications parameters that are listed on the next page.

The main board (larger of the two) has a number of jumpers (or links) also. The links on this main board MAY need to be modified by factory qualified personnel to configure the Quantum™ 4 for specific applications.

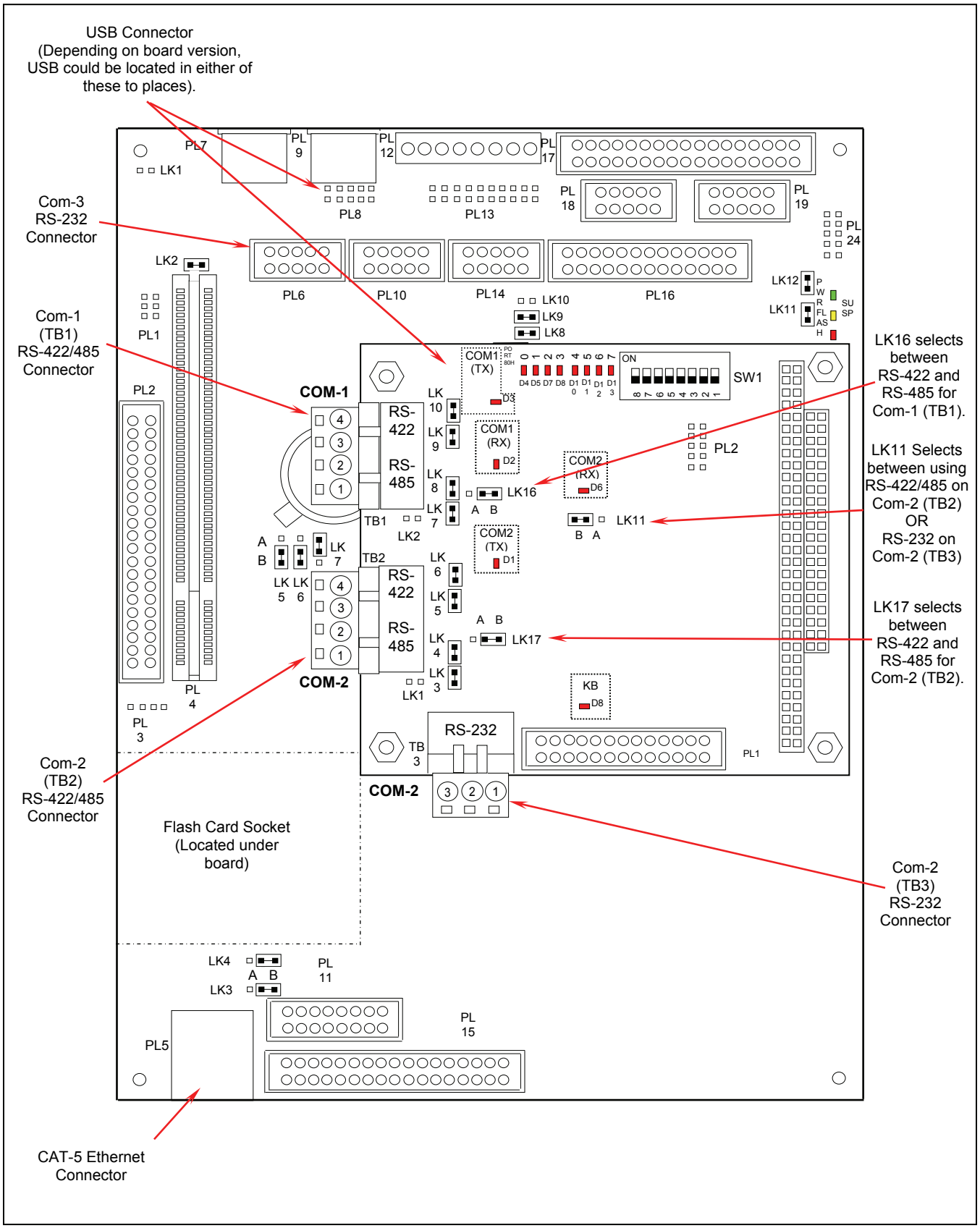
The Quantum™ 4 utilizes Flash Card technology. There is a Flash Card socket located on the under side of this main board. The Quantum™ 4 board has the LX Operating System pre-loaded at the factory, so this Flash Card feature will primarily be utilized for future program updates.

When calling Frick® Company for service or help, we will request the Sales Order number, and the Operating System version number (this can be found on the ***About...*** screen). The more information you have at the time of the call, the better able we will be to assist you.

The information that follows will primarily describe the jumper configuration for communications settings, as well as wiring diagrams for the different types of communications that are possible with the Quantum™ 4.



Quantum™ 4 Main and Communications Boards



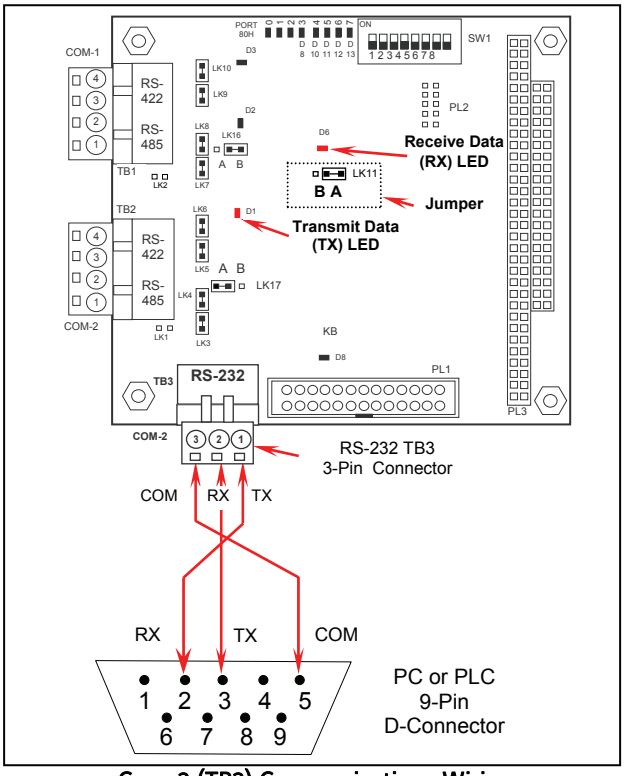
Quantum™ 4 Communications Jumpers, connectors and LED locations

SERIAL COMMUNICATIONS PORT WIRING

RS-232 WIRING AND JUMPERS

TB3, COM-2

The following pictorial shows the communications board, as well as the jumpers, LED's and signal pinouts to allow the end user to communicate to Com-2 (TB3) using RS-232 protocol. Refer to the tables below for the specifics on the jumper settings and wiring convention for RS-232.



Com-2 (TB2) Communications Wiring

Com-2, TB3 Communications Board Jumpers

LINK	POSITION	FUNCTION
LK11	A B *	Select RS-232 for COM2 (TB3) Select RS-422 for COM2 (TB2)

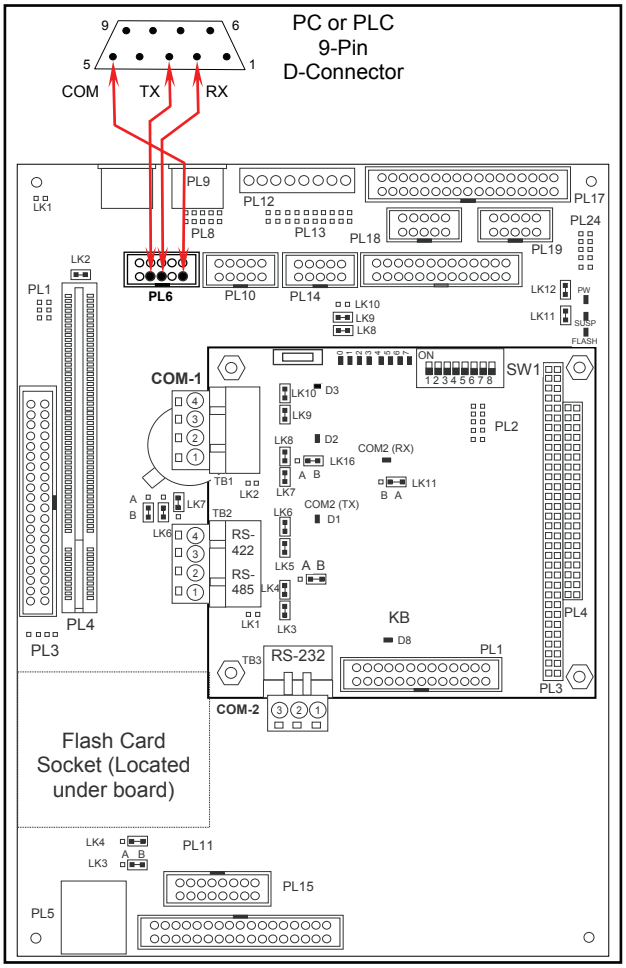
* Standard Setting

Com-2, TB3 Communications Signals

TB3 Connector Pin #	Signal
1	Transmit Data (TX)
2	Received Data (RX)
3	Ground (COM)

PL6, Com-3

The following pictorial shows the communications board, as well as the jumpers, LED's and signal pinouts to allow the end user to communicate to Com-3 (PL6) using RS-232 protocol. Refer to the table below for the specifics on the jumper settings and wiring convention for RS-232. **NOTE:** There are NO jumper settings associated with this connector (Com-3).



PL6 (Com-3) Wiring To 9-Pin D-Connector

Com-3, PL6 Communications Signals

PL6 Connector Pin #	Signal
3	Received Data (RX)
5	Transmit Data (TX)
9	Ground (COM)

RS-422 WIRING AND JUMPERS

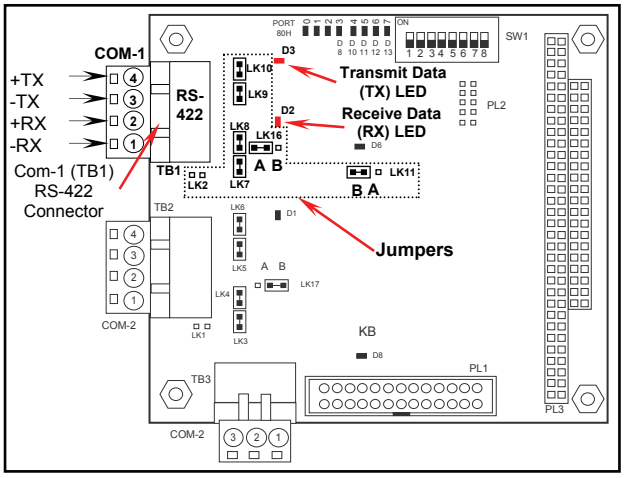
The following table describes the Quantum™ RS-422 connector pinouts and their associated communications signals:

RS-422 (TB1) Signal Wiring

TB1 Connector Pin #	Signal
4	TX+
3	TX-
2	RX+
1	RX-

TB1, COM-1

The following pictorial shows the communications board, as well as the jumpers, LED's and signal pinouts to allow the end user to communicate to Com-1 (TB1) using RS-422 protocol. Refer to the tables on this page for the specifics on the jumper settings and wiring convention for RS-422:



Com-1 (TB1) Connector, Jumpers and LED Location

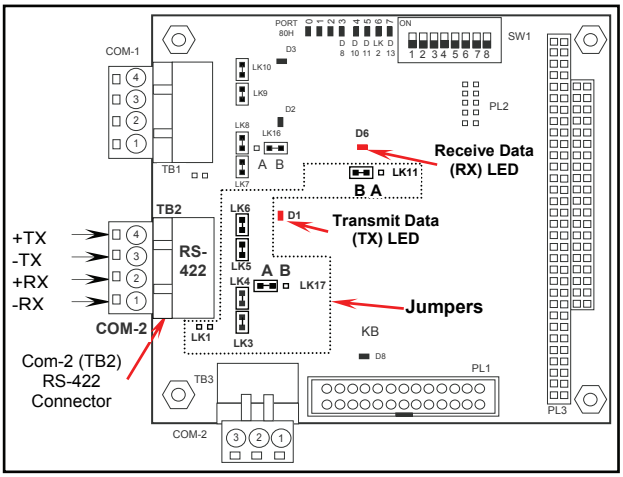
RS-422 (TB1) Board Jumpers

LINK	POSITION	FUNCTION	
LK2	In Out*	Terminate COM1 No termination	RS-422
LK7	In Out*	Pull down COM1 No pull down	RS-422 (-RX)
LK8	In Out*	Pull up COM1 No pull up	RS-422 (+RX)
LK9	In Out*	Pull down COM1 No pull down	RS-422 (-TX)
LK10	In Out*	Pull up COM1 No pull up	RS-422 (+TX)
Lk11	A B*	Select RS-232 for COM2 (TB3) Select RS-422 for COM2 (TB2)	
LK16	A * B	COM1 RS-422 (TB1) COM1 RS-485 (TB1)	

* Standard Setting

TB2, COM-2

The following pictorial shows the communications board, as well as the jumpers, LED's and signal pinouts to allow the end user to communicate to Com-2 (TB2) using RS-422 protocol. Refer to the tables on this page for the specifics on the jumper settings and wiring convention for RS-422:



Com-2 (TB2) Connector, Jumpers and LED Location

RS-422 (TB2) Communications Board Jumpers

LINK	POSITION	FUNCTION	
LK 1	In Out*	Terminate COM2 No termination	RS-422
LK 3	In Out*	Pull down COM2 No pull down	RS-422 (Rx-)
LK 4	In Out*	Pull up COM2 No pull up	RS-422 (Rx+)
LK 5	In Out*	Pull down COM2 No pull down	RS-422 (Tx-)
LK 6	In Out*	Pull up COM2 No pull up	RS-422 (Tx+)
LK 11	A B*	Select RS-232 for COM2 (TB3) Select RS-422 for COM2 (TB2)	
LK 17	A * B	COM2 RS-422 (TB2) COM2 RS-485 (TB2)	

* Standard Setting

RS-485 WIRING AND JUMPERS

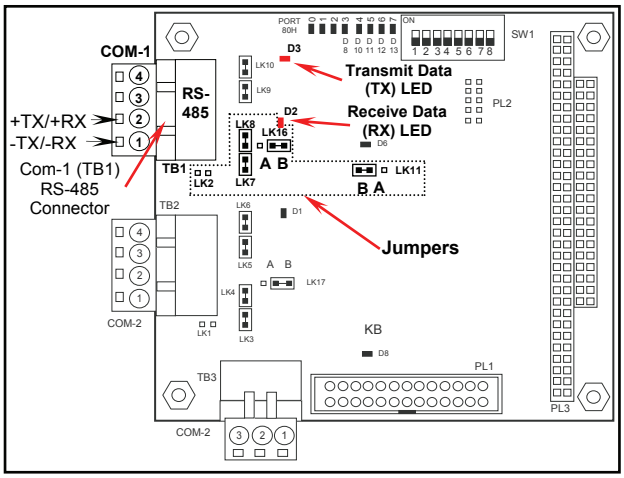
The following table describes the Quantum™ RS-485 connector pinouts and their associated communications signals:

RS-422 (TB1) Communications Signal Wiring

TB1 Connector Pin #	Signal
2	+TX / +RX
1	-TX / -RX

TB1, COM-1

The following pictorial shows the communications board, as well as the jumpers, LED's and signal pinouts to allow the end user to communicate to Com-1 (TB1) using RS-485 protocol. Refer to the tables on this page for the specifics on the jumper settings and wiring convention for RS-485.



Com-1 Connector, Jumpers and LED Location

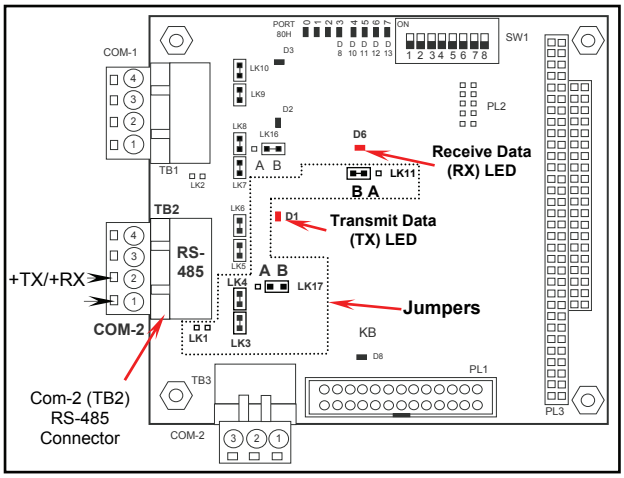
RS-485 (TB1) Communications Board Jumpers

LINK	POSITION	FUNCTION
LK2	In Out*	Terminate COM1 No termination RS-485
LK7	In Out*	Pull down COM1 No pull down RS-485 (-TX / -RX)
LK8	In Out*	Pull up COM1 No pull up RS-485 (+TX / +RX)
Lk11	A B*	Select RS-232 for COM2 (TB3) Select RS-485 for COM2 (TB2)
LK16	A B *	COM1 RS-422 (TB1) COM1 RS-485 (TB1)

* Standard Setting

TB2, COM-2

The following pictorial shows the communications board, as well as the jumpers, LED's and signal pinouts to allow the end user to communicate to Com-2 (TB2) using RS-485 protocol. Refer to the tables on this page for the specifics on the jumper settings and wiring convention for RS-485.



Com-2 Connector, Jumpers and LED Location

RS-485 (TB2) Communications Board Jumpers

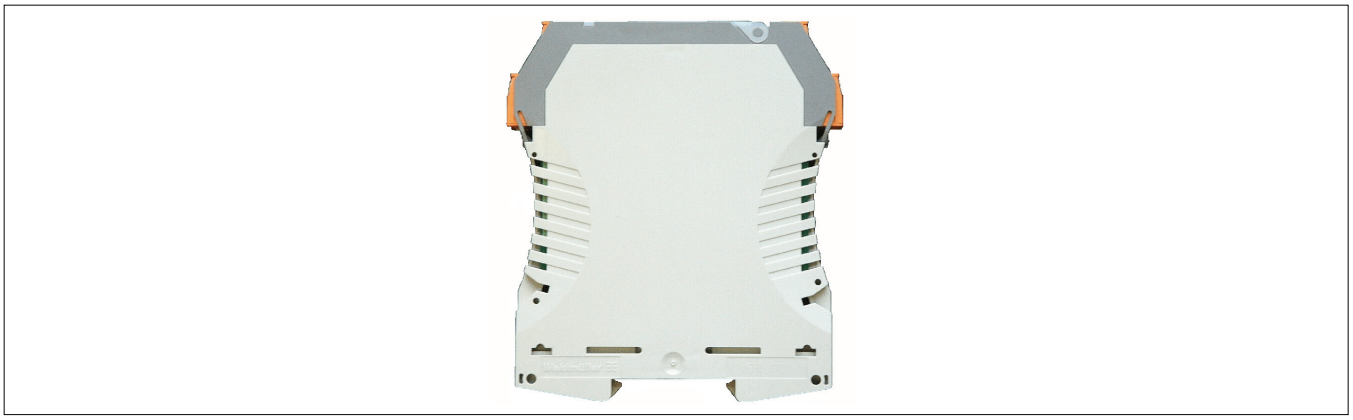
LINK	POSITION	FUNCTION
LK 1	In Out*	Terminate COM2 No termination RS-485
LK 3	In Out*	Pull down COM2 No pull down RS-485 (-TX / -RX)
LK 4	In Out*	Pull up COM2 No pull up RS-485 (+TX / +RX)
LK 11	A B*	Select RS-232 for COM2 (TB3) Select RS-422 for COM2 (TB2)
LK 17	A * B	COM2 RS-422 (TB2) COM2 RS-485 (TB2)

* Standard Setting

CONVERTING AN RS-232 SIGNAL TO RS-422/485

In order to communicate to the Quantum™ controller via RS-422 or RS-485 on Comm. Ports 1 or 2, you will need to convert the RS-232 signal from the source (Note: If the originating signal is already RS-422/485, the Quantum™ LX can accept these signals directly on the 4-pin connectors of Comm. Ports 1 & 2).

One converter that can be used is a DIN rail mountable device, the **Frick® Serial Communications Converter Module**, manufactured by YORK International (P/N 639B0086H01). This module will allow the conversion from a standard RS-232 signal to either RS-422 or RS-485 or vice-versa. The module is powered from a 24VDC source. It can be used in a standalone panel along with an Allen Bradley SLC or with an external modem.



Frick® Serial Communications Converter Module

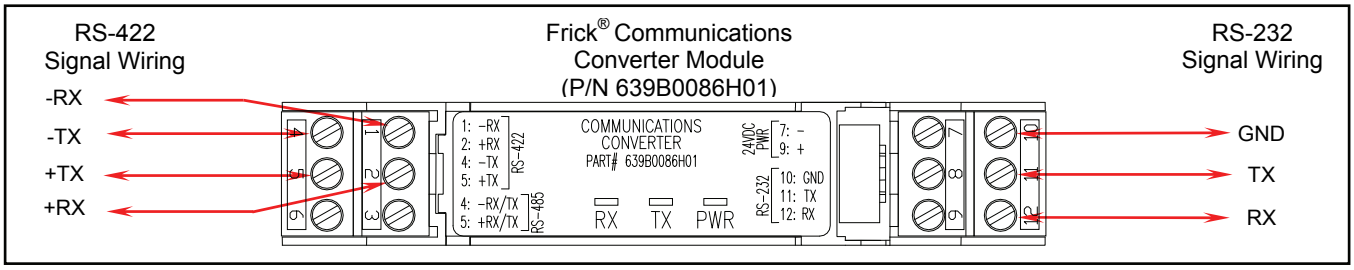
Once DIP switch settings on the converter module have been verified, you will need to verify the jumper settings of the Quantum™ controller.

After verifying both the Converter module and Quantum™ settings, the interconnecting wiring must be done. Be sure to use 4-conductor shielded communications cable (two wires for transmit, two for receive) for RS-422, or 2-conductor shielded cable for RS-485.

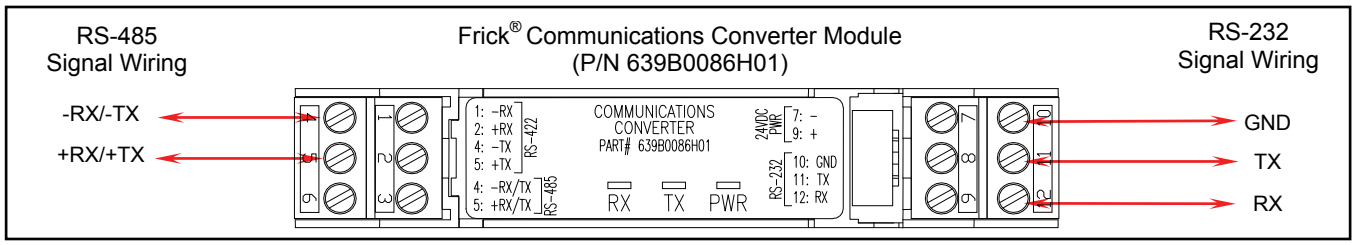
NOTE: Refer to Appendix A for additional information, or the manual (S90-0700 I) that comes with the module.

CONVERTER MODULE CONNECTIONS

MODLUE	POWER	RS-232	RS-422	RS-485
Pin 1			-RX	
Pin 2			+RX	
Pin 3				
Pin 4			-TX	-RX / -TX
Pin 5			+TX	+RX / +TX
Pin 6 (Not Used)				
Pin 7	- 24VDC			
Pin 8 (Not Used)				
Pin 9	+24VDC			
Pin 10		GND		
Pin 11		TX		
Pin 12		RX		



RS-422 and RS-232 Wiring signals for the Communications Converter Module

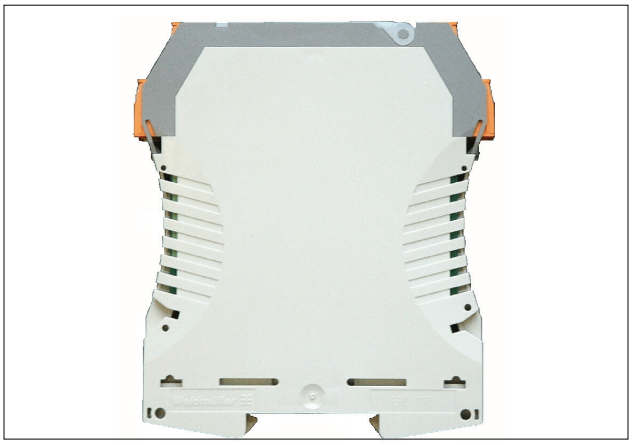


RS-485 and RS-232 Wiring signals for the Communications Converter Module

APPENDIX A
FRICK® SERIAL COMMUNICATIONS CONVERTER MODULE
(Part Number 639B0086H01)

Description

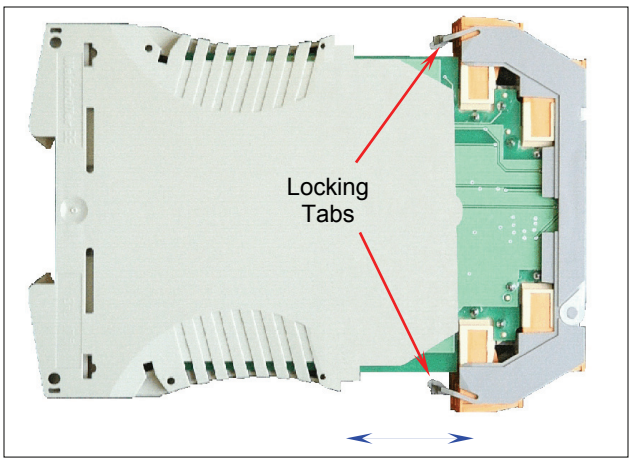
Frick® Controls has developed a DIN-rail mountable communications module for the purpose of converting typical RS-232 serial protocol to either RS-422 or RS-485 serial protocols. The module will also work converting RS-422 or RS-485 to RS-232 (bi-directional). Due to the tight mounting restrictions in many existing control panels, this module provides the ultimate solution for field communications upgrades or modifications. No drilling is required, and no valuable space is lost. The only requirement is an external source of 24 volt DC power.



Frick® Communications Converter Module

Setting the jumpers

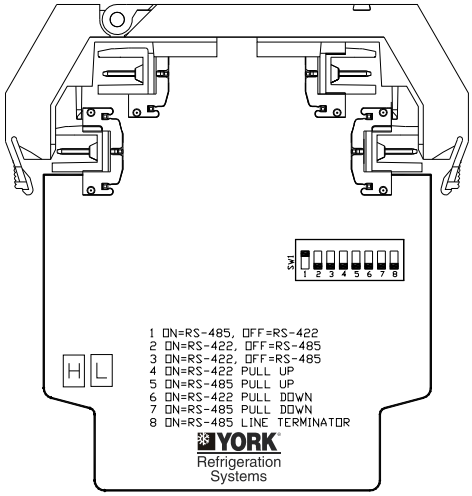
Inside the module is a circuit board which contains a DIP switch. This switch must be set according to the necessary protocol parameters that you are trying to achieve. It is recommended to set or verify the settings of this DIP switch before mounting and wiring the module. The circuit board must be removed from its housing in order to access this DIP switch. Each end of the housing has a small tab, located just below the bottom most terminal block of each end. Hold the module as shown in the following pictorial.



Disassembling the module

Press the tabs using the thumb and finger, and with your other hand carefully slide the circuit board out of the housing. Ensure that proper anti-static guidelines are followed while handling the circuit board.

The following diagram shows the circuit board.



Module circuit board

For easy reference, the DIP switch position functions are provided on the board. For the purpose of clarity however, refer to the following table.

MODULE DIP SWITCH SETTINGS

Switch Position	ON Function	OFF Function
1	RS-485	RS-422
2	RS-422	RS-485
3	RS-422	RS-485
4	RS-422 Pull up	No pull up
5	RS-485 Pull up	No pull up
6	RS-422 Pull down	No pull down
7	RS-485 Pull down	No pull down
8	RS-485 line termination	No line termination

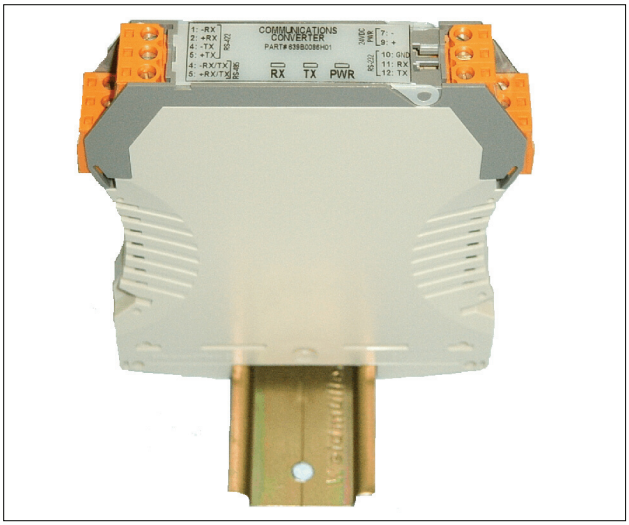
Mounting the module

This module can be mounted on the standard din rail that is available in most control panels.

1. Find an open area of the din rail (5/8 inch minimum, for the width of the module), and preferably as far away from any inductive loads (relays, contactors, etc.) as possible.

2. Module orientation is not critical, however, try to mount it so that all wiring connections can be made neatly, and according to any applicable local codes.

3. Catch one end of the DIN rail latch (at the bottom of the module, under one edge of the DIN rail, then snap the other latch onto the opposite side of the DIN rail, as shown below.



Module mounted to DIN rail

Wiring the module

There are twelve total wire terminal points on this module. Refer to the following table for the pin-out.

Wire terminal connections

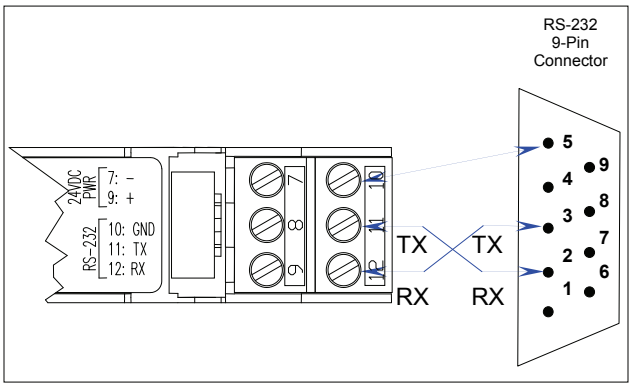
Terminal Position	Module Power	RS-232	RS-422	RS-485
1			-RX	
2			+RX	
3 (Not Used)				
4			-TX	-RX/-TX
5			+TX	+RX/+TX
6 (Not Used)				
7	-24 VDC			
8 (Not Used)				
9	+24 VDC			
10		GND		
11		RX		
12		TX		

1. Locate a suitable source for the +24 volt DC power. Using a minimum of 18 AWG stranded wire, connect the MINUS wire to terminal # 7. Connect the PLUS wire to terminal # 8.

2. All remaining connections will be based upon the particular protocols that you have decided to use. Simply match the SIGNAL NAME from the source device to match the SIGNAL NAME of the module. All external communications wiring must conform with the Frick® ***Proper Installation of Electronic Equipment in an Industrial Environment*** publication.

RS-232 CONNECTIONS

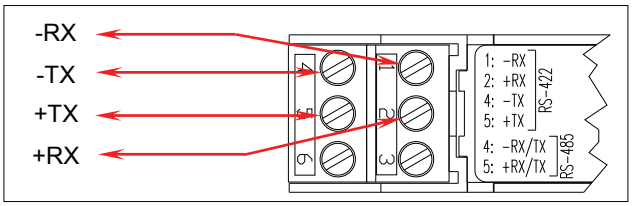
Refer to the following figure for the pin connections showing how to wire a standard 9-Pin RS-232 connector directly to the Frick® Communications Converter Module.



RS-232 Connections

RS-422 Connections

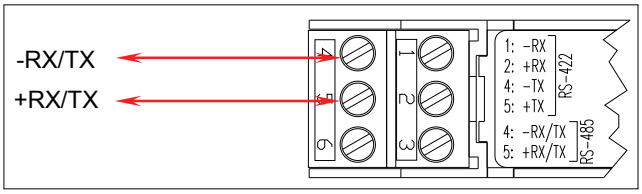
Refer to the following figure for the pin connections showing how to attach a 4-wire RS-422 cable directly to the Frick® Communications Converter Module.



RS-422 Connections

RS-485 Connections

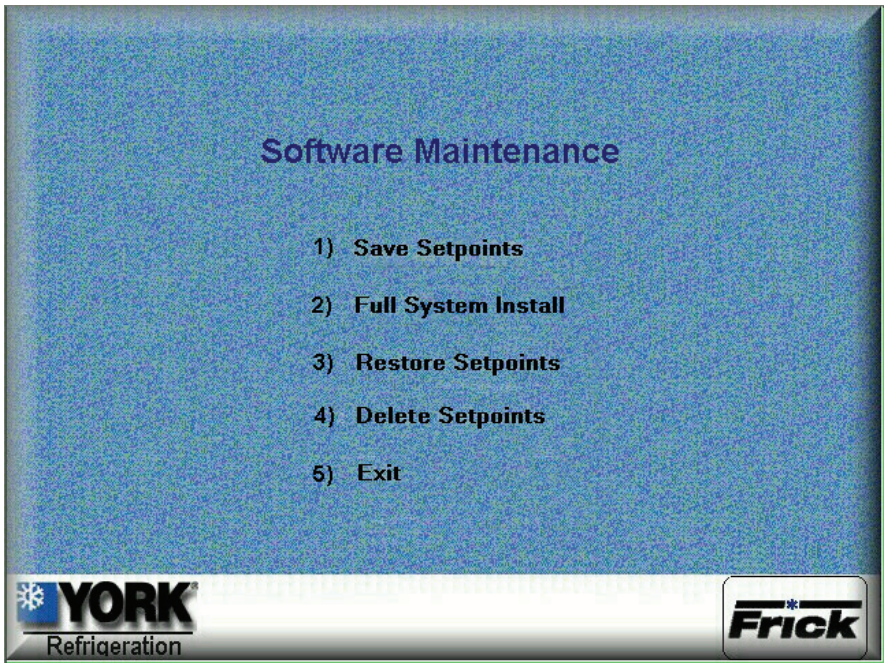
Although typical RS-485 communications requires a control signal to change the state of the RX/TX driver lines to establish handshaking, this board incorporates a smart feature that handles this handshaking internally, without the user needing to provide it. It is a true two-wire system. Refer to the following figure for the pin connections showing how to attach a 2-wire RS-485 cable directly to the Frick® Communications Converter Module:



RS-485 Connections

APPENDIX B
QUANTUM™ LX PANEL SOFTWARE UPDATE PROCEDURE

Access the Software Maintenance screen by setting the User Level to 2, then clicking on *Menu*, then *Service*, and finally *Software Maintenance*.

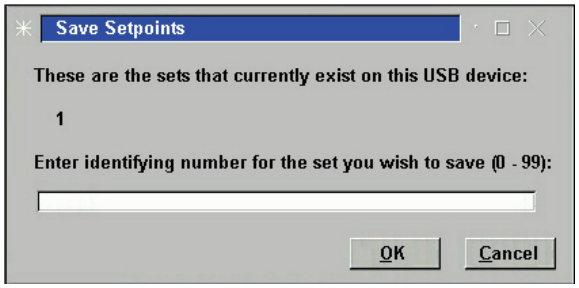


ACCESSING: → Service... → Software Maintenance

DESCRIPTION: This screen allows the technician to perform system software maintenance.

1) **Save Setpoints** - Use this option to save all setpoints and custom text to a USB device as a form of backup):

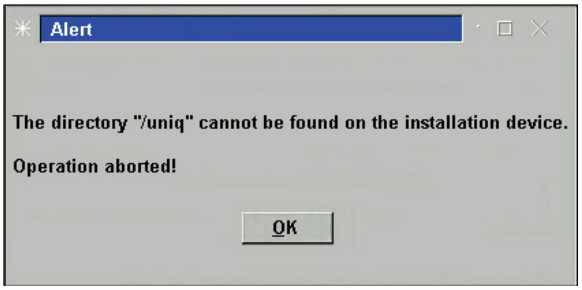
- Ensure that all setpoint values have been documented as a safety precaution Install a USB device into the provide connection on the Qunatum™.
- Press the **[1]** button.
- The software program will read the USB device, and the following dialog box will appear:



- Any numerals that appear on the center line of this box, will represent units that have already been saved (from 1 to 30). If no units have yet been saved, the center line will be blank.
- Enter a number on the keypad that corresponds to the unit number that you wish to save, then press **[Enter]**. If the unit number has not been saved before, the setpoints will be saved to a file on the USB device (a progress bar will appear asking you to *Please Wait...* In the future, any time you try to write the setpoints to this number, you will be prompted with a message telling you that *the set number already exists – do you wish to overwrite it?* Answer by highlighting the *Yes* button, and pressing **[Enter]** if you do indeed wish to overwrite the values. If you enter a number that does not appear on the center line, no such warning will appear.
- After the file has been written or updated, the dialog boxes will disappear, and you can either exit, or continue with another function.

2) **Full System Install** - Use this option to install the entire operating system. This function will not overwrite any setpoints or custom text that may have previously been setup:

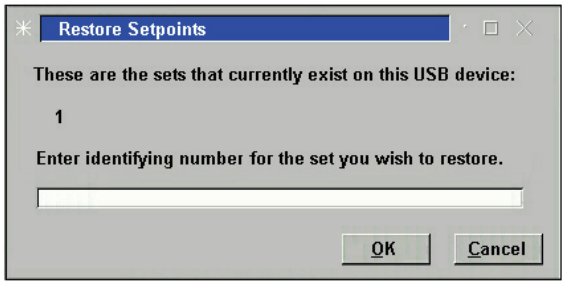
- Ensure that all setpoint values have been documented as a safety precaution.
- Press the **[2]** button.
- If a valid USB device with the operating system loaded on it is plugged in, the software will be loaded. If however, there is no USB device installed, or the device does not contain the operating software, the following dialog box will appear:



- If the above dialog box appears, you must insert a valid USB device that has the operating system loaded on it.

3) **Restore Setpoints** – Use this option to re-load previously saved setpoints and custom text to the Quantum™.

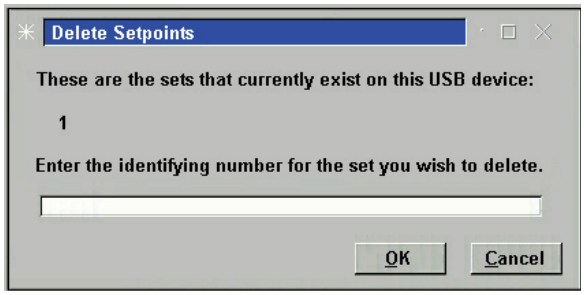
- Ensure that all setpoint values have been documented as a safety precaution. Install the previously saved setpoint USB device into the provided connection on the Qunatum™.
- Press the **[3]** button.
- The software program will read the USB device, and the following dialog box will appear:



- Any numerals that appear on the center line of this box, will represent units that have already been saved (from 1 to 30). If no units have yet been saved, the center line will be blank and therefore there are no setpoints to restore.
- Enter a number on the keypad that corresponds to the unit number that you wish to restore, then press **[Enter]**.
- A progress bar will appear asking you to *Please Wait...*
- After the file has been written or updated, the dialog boxes will disappear, and you can either exit, or continue with another function.

4) **Delete Setpoints** – Use this option to delete the setpoints and custom text for a particular unit.:

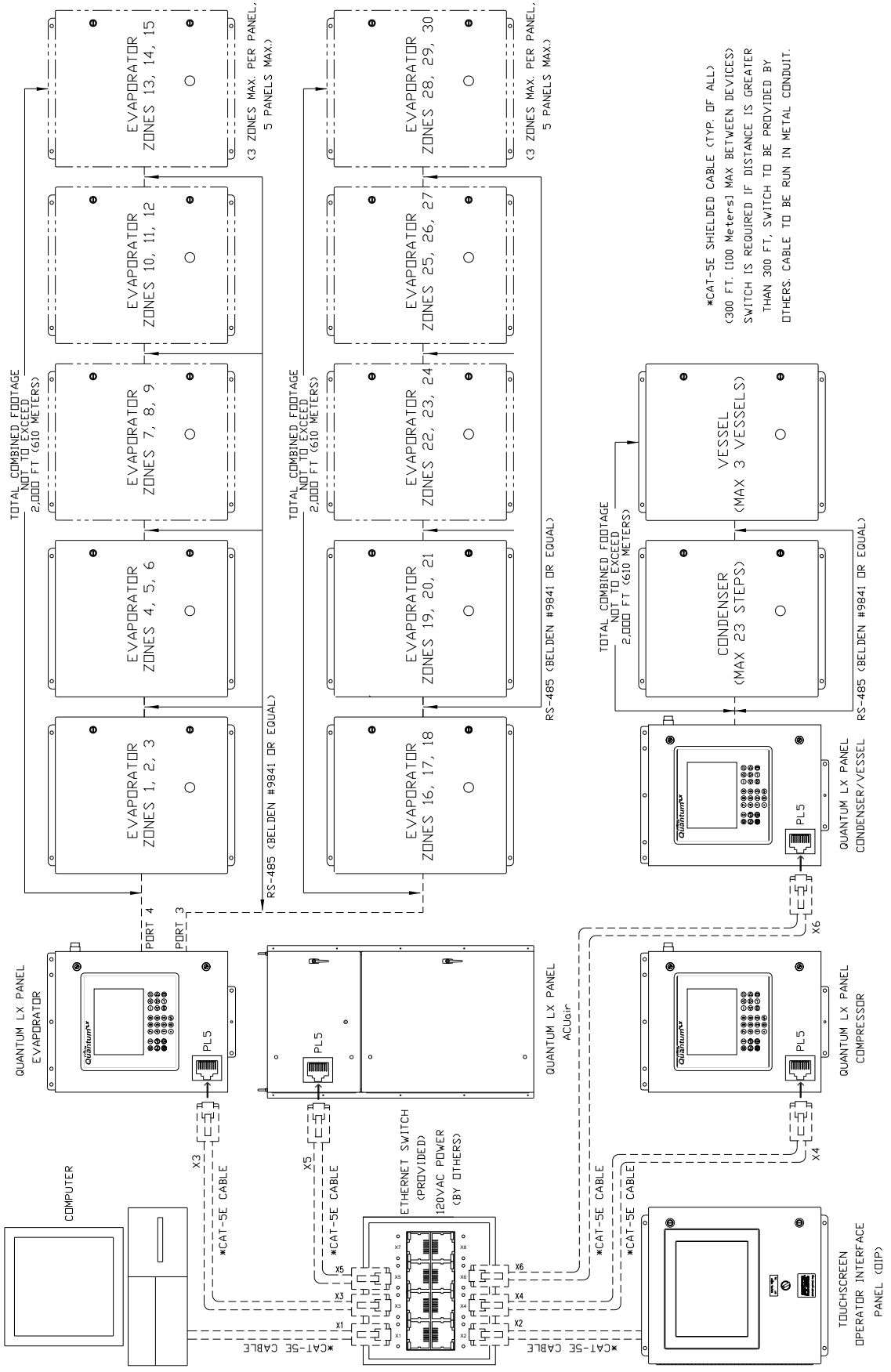
- Ensure that all setpoint values have been documented as a safety precaution. Install the previously saved setpoints USB device into the provided connection on the Qunatum™.
- Press the **[4]** button.
- The software program will read the USB device, and the following dialog box will appear:



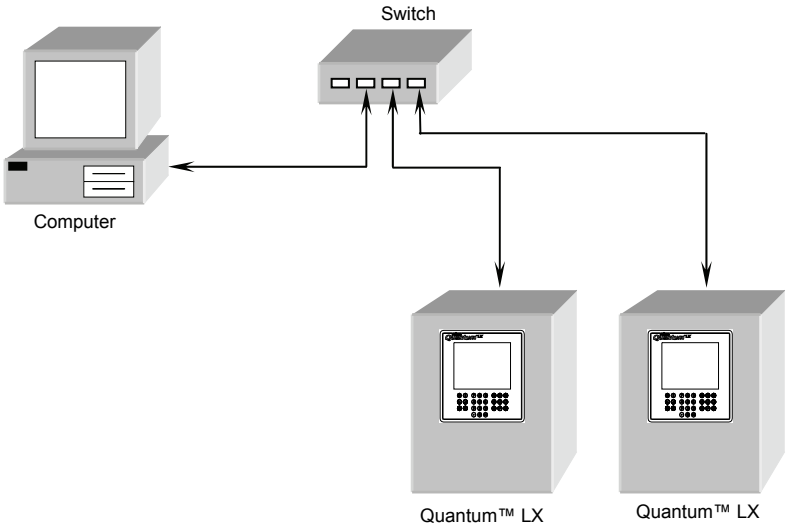
- Any numerals that appear on the center line of this box, will represent units that have already been saved (from 1 to 30). If no units have yet been saved, the center line will be blank, and therefore there are no setpoints to delete.
- Enter a number on the keypad that corresponds to the unit number that you wish to delete, highlight the *Ok* button, then press **[Enter]**. You will be prompted with a new dialog box which will ask you *OK to delete set number (1-30)?*
- Highlight the *Yes* button, and press **[Enter]**. The dialog box will be updated with a new message stating that *Set number (1-30) has been deleted!*
- Press **[Enter]** to return to the Software Maintenance menu.

5) **Exit** - Use this selection to leave this screen by pressing the **[5]** button, the panel will reboot and return to the ***Operating Status*** screen.

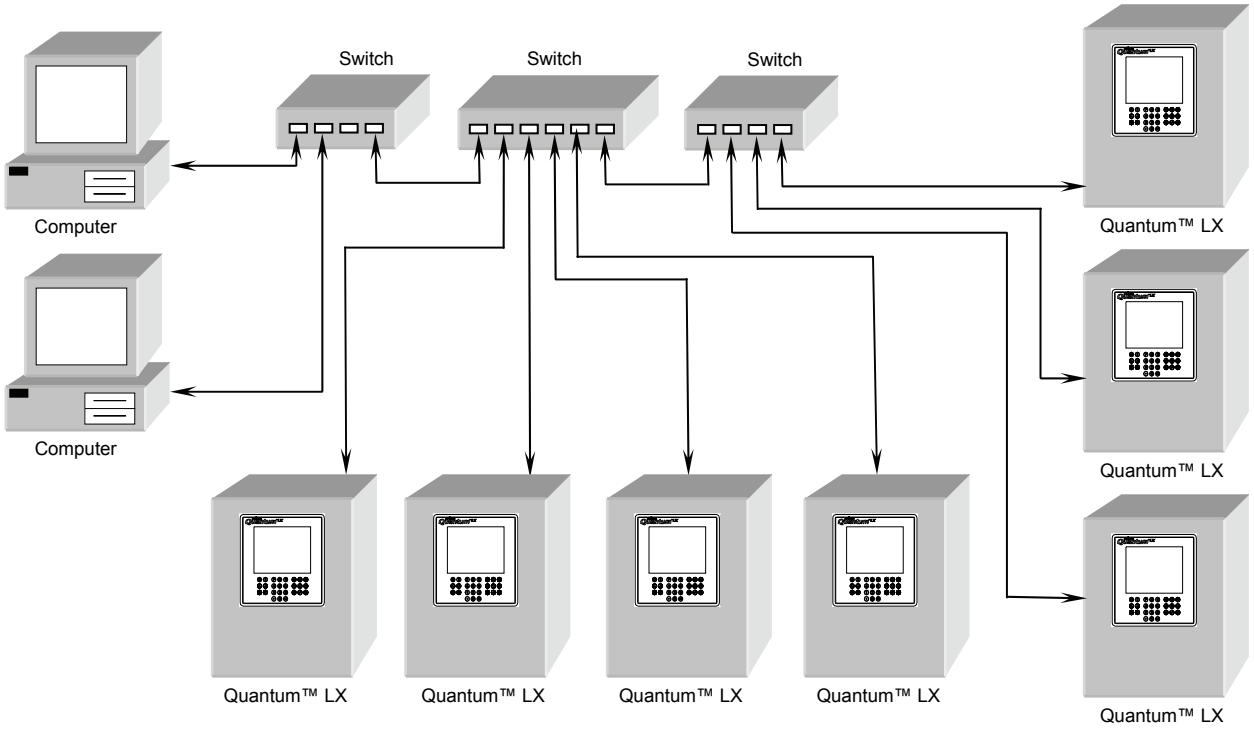
APPENDIX C
QUANTUM™ LX ETHERNET COMMUNICATIONS WIRING



QUANTUM™ LX LOCAL ETHERNET CONFIGURATIONS

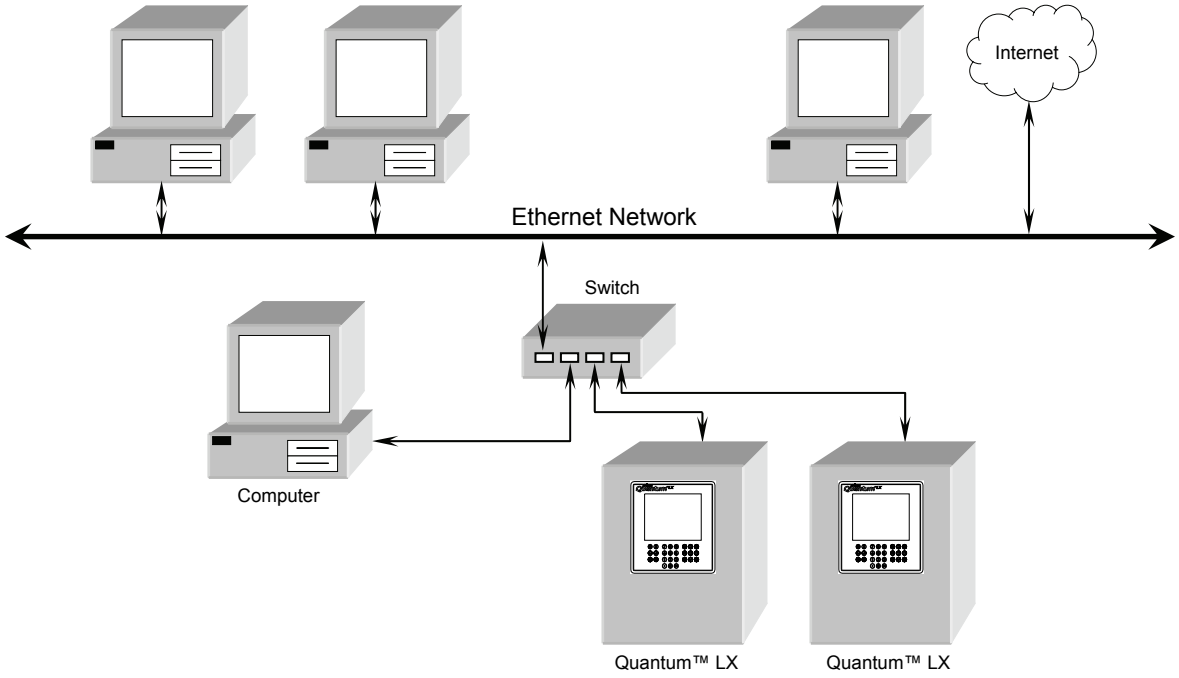


Typical Small Local Quantum™ LX Ethernet Configuration

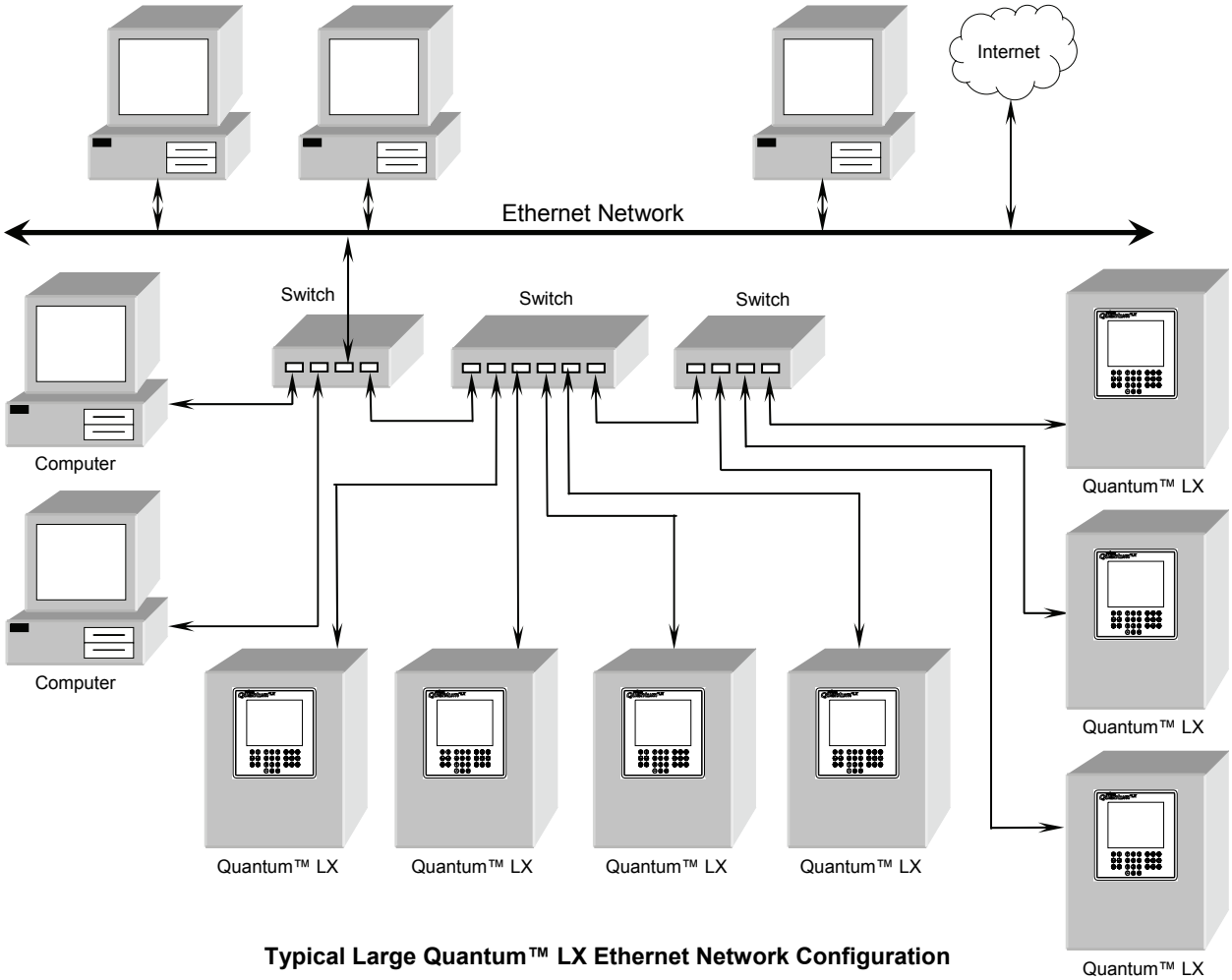


Typical Large Local Quantum™ LX Ethernet Configuration

QUANTUM™ LX ETHERNET NETWORK CONFIGURATIONS

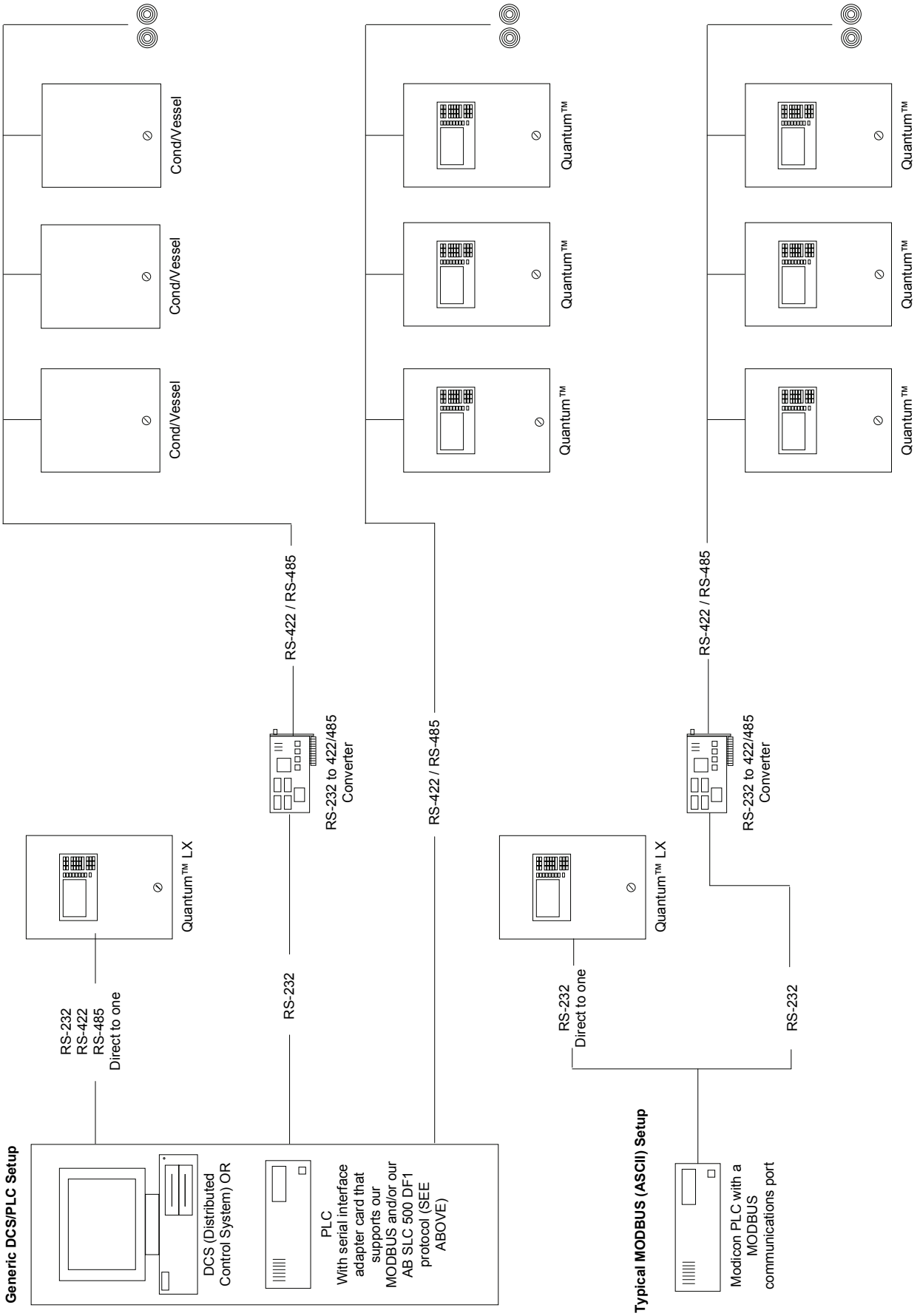


Typical Small Quantum™ LX Ethernet Network Configuration



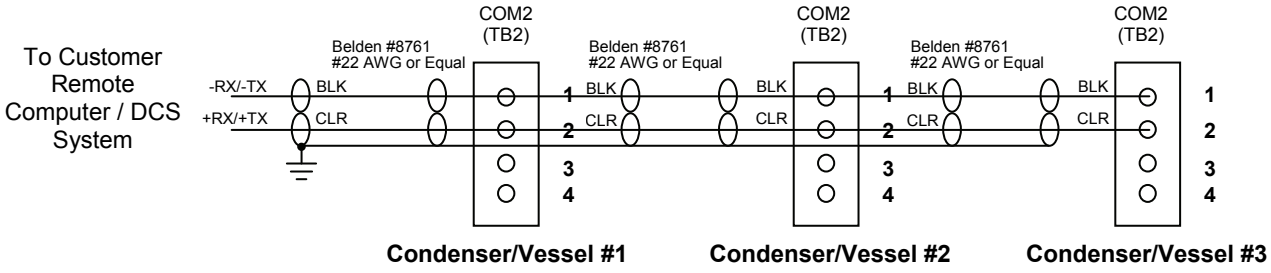
Typical Large Quantum™ LX Ethernet Network Configuration

SERIAL CONNECTIONS PICTORIAL

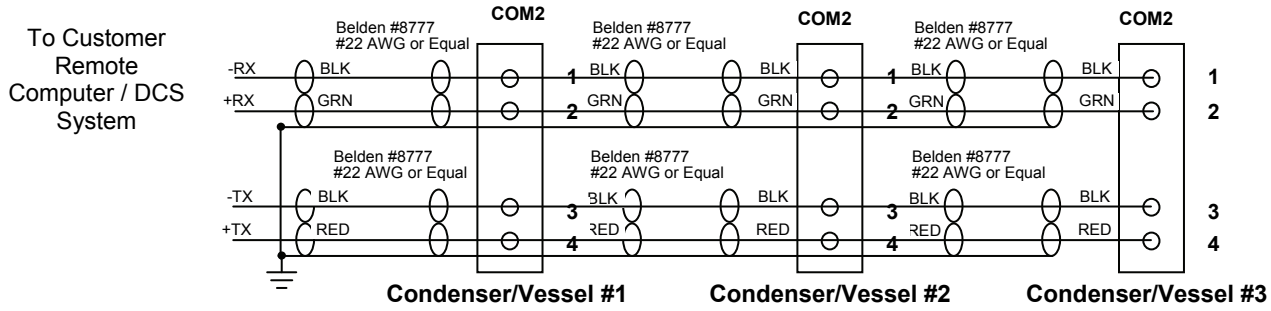


SERIAL COMMUNICATIONS WIRING DIAGRAMS

WIRING DIAGRAM – QUANTUM™ LX TO CUSTOMER REMOTE COMPUTER/DCS RS-485 COMMUNICATIONS



WIRING DIAGRAM – QUANTUM™ LX TO CUSTOMER REMOTE COMPUTER/DCS RS-422 COMMUNICATIONS



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